# GROUP 23A

# CVT

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# SERVICE SPECIFICATIONS

M1231200300041

| Item | | Standard value |
|---|---|---|
| CVT fluid temperature sensor resistance kΩ | At 0°C | 16.7 – 20.5 |
| | At 20°C | 7.3 – 8.9 |
| | At 40°C | 3.4 – 4.2 |
| | At 60°C | 1.9 – 2.2 |
| | At 80°C | 1.0 – 1.2 |
| | At 100°C | 0.57 – 0.69 |
| Damper clutch control (DCC) solenoid valve coil resistance (at 20°C) Ω | | 2.9 – 3.5 |
| Clutch pressure control solenoid valve coil resistance (at 20°C) Ω | | 2.9 – 3.5 |
| Line pressure control solenoid valve coil resistance (at 20°C) Ω | | 2.9 – 3.5 |
| Shift control solenoid valve coil resistance (at 20°C) Ω | | 2.9 – 3.5 |
| Stall speed r/min | D range | 2,200 – 2,700 |
| | R range | 1,800 – 2,300 |

# LUBRICANTS

M1231200400048

| Item | Specified lubricants | Capacity L |
|---|---|---|
| CVT fluid | DIA QUEEN ATF SP III | 8.1 |

# SEALANTS AND ADHESIVES

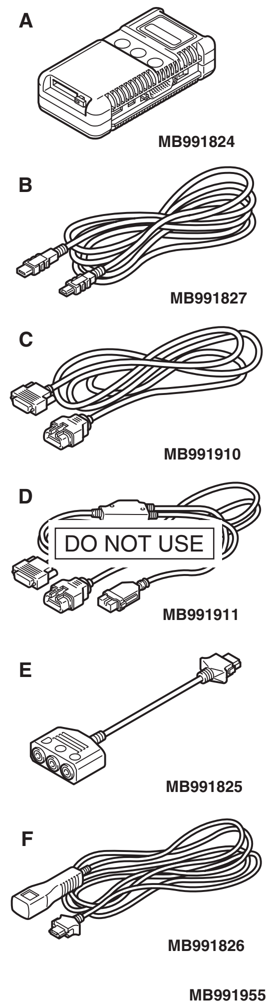
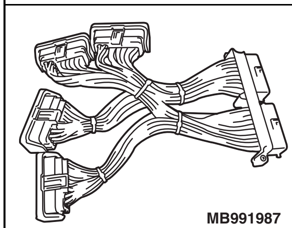
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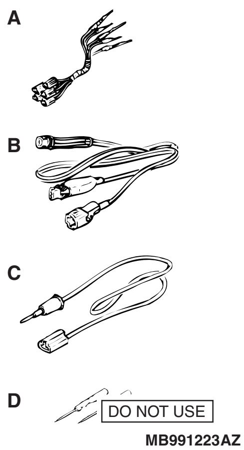
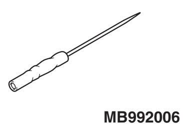
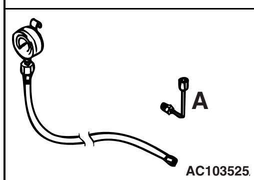
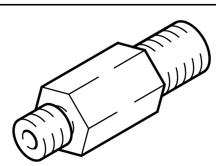
| Item | Specified sealant | Remarks |
|---|---|---|
| Secondary rear cover | MITSUBISHI GENUINE PART MD974421 or equivalent | Semi-drying sealant |
| Primary rear cover | | |
| Valve body cover | | |

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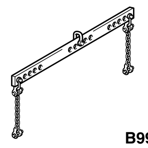
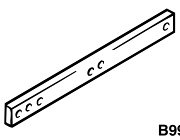
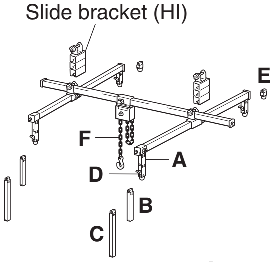
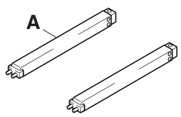
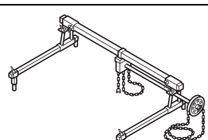
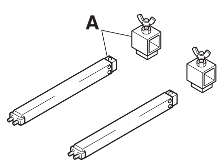
# SPECIAL TOOLS

M1231200600116

| Tool | No. | Name | Application |
|---|---|---|---|
|   | MB991955<br>A: MB991824<br>B: MB991827<br>C: MB991910<br>D: MB991911<br>E: MB991825<br>F: MB991826 | M.U.T.-III sub-assembly<br>A: Vehicle Communication Interface (V.C.I.)<br>B: M.U.T.-III USB cable<br>C: M.U.T.-III main harness A (Vehicles with CAN communication system)<br>D: M.U.T.-III main harness B (Vehicles without CAN communication system)<br>E: M.U.T.-III measurement adapter<br>F: M.U.T.-III trigger harness | Checking the CVT<br>⚠ CAUTION<br>**For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.** |
|   | MB991987 | Power plant ECU check harness | • Inspection using an oscilloscope<br>• Inspection of the engine-CVT-ECU terminal voltage check |

| Tool | No. | Name | Application |
|---|---|---|---|
|  | MB991223<br>A: MB991219<br>B: MB991220<br>C: MB991221<br>D: MB991222 | Harness set<br>A: Check harness<br>B: LED harness<br>C: LED harness adapter<br>D: Probe | For checking voltage (continuity and value) at harness and connectors<br>A: For checking connector pin contact voltage<br>B: For checking power supply circuits<br>C: For checking power supply circuits<br>D: For connection to commercially available testers |
|  | MB992006 | Extra fine probe | Making voltage and resistance measurement during troubleshooting |
|  | MD998330<br>A: MD998331 | Oil pressure gauge (3.0 MPa)<br>A: Oil pressure gauge joint | Hydraulic pressure measurement |
|  | MD998332 | Hose adapter | Oil pressure gauge connection |

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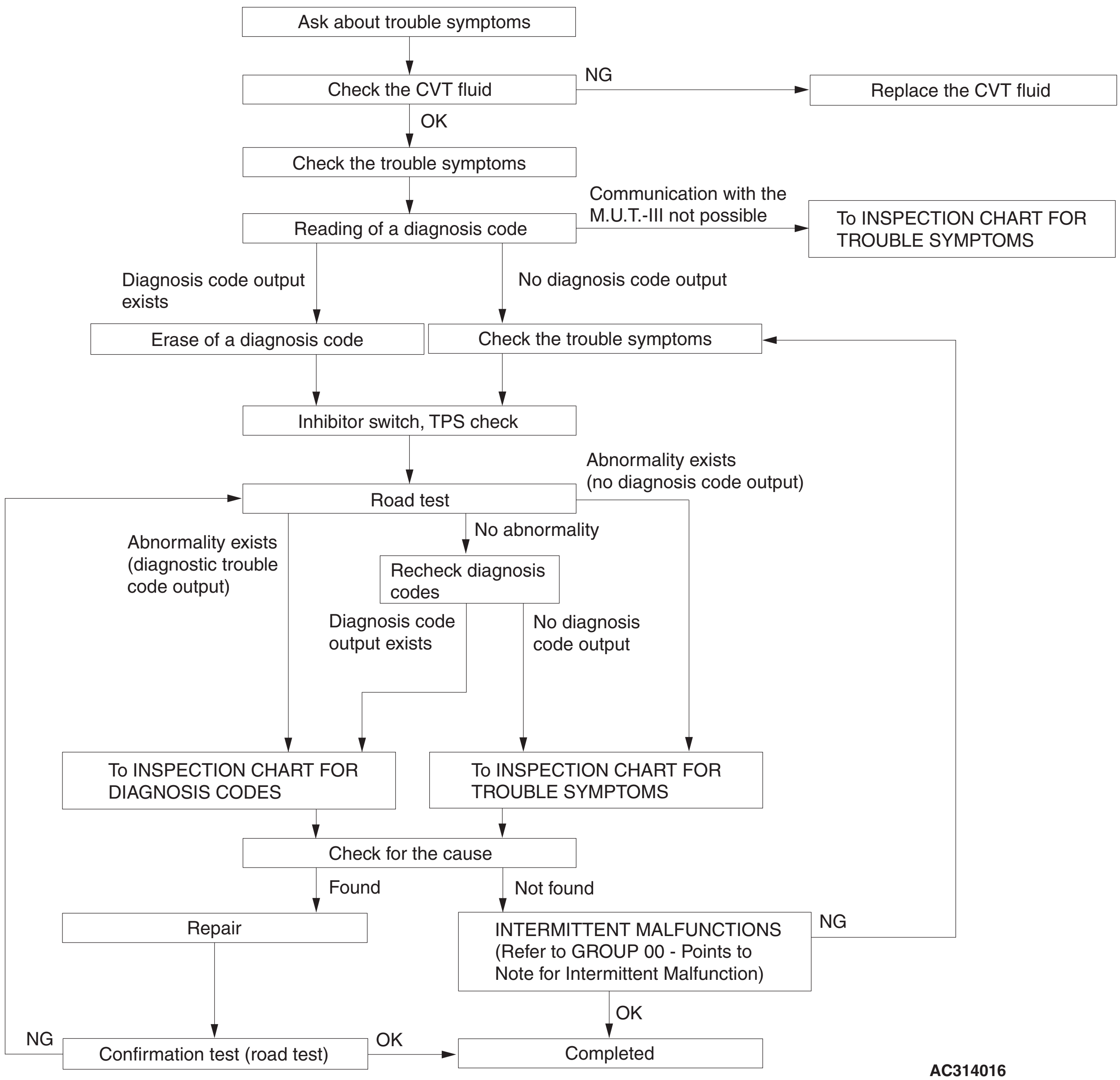
| Tool | No. | Name | Application |
|---|---|---|---|
|  B991454 | MB991454 | Engine hanger balancer | Supporting the engine when removing and installing the automatic transmission assembly<br>1. For the engine hanger balancer (MB991454), use the chain only.<br>2. When using the engine hanger (MB991928), install the engine hanger attachment (MB991925).<br>3. When using the engine hanger (MB991895), install the engine hanger attachment (MB991924).<br>*NOTE: The engine hanger balancer (MB991454) is part of the engine hanger assembly (MB991453).* |
|  B991527 | MB991527 | Hanger | |
|   B991928 | MB991928<br>A: MB991929<br>B: MB991930<br>C: MB991931<br>D: MB991932<br>E: MB991933<br>F: MB991934 | Engine hanger<br>A: Joint (50) × 2<br>B: Joint (90) × 2<br>C: Joint (140) × 2<br>D: Foot (standard) × 4<br>E: Foot (short) × 2<br>F: Chain and hook assembly | |
|   B991925 | MB992005 (two pieces)<br>A: MB991925 (one piece) | Engine hanger attachment set<br>A: Engine hanger attachment | |
|  Z203830 | MB991895 | Engine hanger | |
|   B991924 | MB992004 (two sets)<br>A: MB991924 (one set) | Engine hanger attachment set<br>A: Engine hanger attachment | |

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# TROUBLESHOOTING <CVT>

## STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

M1231213500090




## LEARNED VALUE INITIALIZATION PROCEDURE FOR CVT

M1231202400077

### AIM

The use of EEPROM has enabled the CVT learned value to be retained even after the battery terminals are disconnected. However, the learned value should be initialised if the CVT assembly, the engine assembly, the valve body assembly or the solenoid valves are replaced. The initialisation procedure is as below:

### INITIALISATOIN PROCEDURE

1. Shift the selector lever to the P range and turn the ignition switch to the LOCK (OFF) position. Then, connect the M.U.T.-III to the diagnosis connector.
2. Initialise the learned value on the initialisation screen.
3. After this initialization, make the system learn the hydraulic pressure control in accordance with "CVT Fluid Pressure Control Learning Procedure."(Refer to P.23A-8).

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*NOTE: This reset procedure will also automatically initialize the INVECS-III Learned Value. CVT DTCs and CVT freeze-frame data will be erased. (Engine DTCs, engine-related freeze-frame data, and Readiness status will remain even after CVT Learned Value is reset.)*

## CVT FLUID PRESSURE CONTROL LEARNING PROCEDURE

M1231225500053

### AIM

If learned values are initialised, shift quality may be reduced. For how to make the system learn, follow the procedure below.

### LEARN PROCEDURE

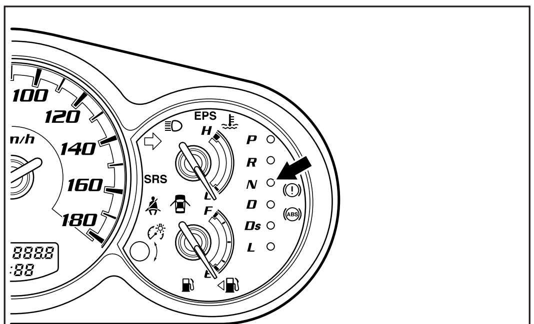
| Step | Item | | Description |
|---|---|---|---|
| 1 | Engine idle learn. | | Refer to GROUP 00 – Precautions Before Service, Learning Procedure for Idling in MPI Engine P.00-21. |
| 2 | CVT fluid cooling. | | With the vehicle parked in the place with a relatively lower temperature, the vehicle should be left with the ignition switch turned OFF until the CVT fluid temperature is equal to the outside air temperature. |
| 3 | Learn in cold start. | (1) Measurement of CVT fluid temperature. | Measure the CVT fluid temperature using the M.U.T.-III. (Ensure that the CVT fluid temperature is equal to the outside air temperature). |
| | | (2) Garage shift learn. | ⚠ CAUTION<br>**When the selector lever is moved to N to D and N to R, the lever must be retained in the individual ranges for at least 2 seconds. Especially in the N range, the selector lever should be shifted to other ranges after the engine speed is stable. (Rapid shift operation may cause incorrect learning with the combined pressure as residual pressure and unstable engine speed).**<br>• Start the engine, and move the selector lever to N to D and N to R two or three times respectively. When no shift shock is detected, this learn procedure will be completed.<br>• When a large shift shock is detected, repeat the same operation of N to D and N to R until no shift shock is detected (max.10 times each) to complete. |
| | | (3) Line pressure and shift control learn. | Move the selector lever to the D range, and let the engine run at idle for 20 seconds with the vehicle stationary. |
| | | (4) CVT fluid temperature adjustment | Increase CVT fluid temperature up to 40°C. |
| | | (5) Direct-connection control learn. | Drive the vehicle for 5 seconds at 40 – 50 km/h with the selector lever positioned in the D range. |

| Step | Item | | Description |
|---|---|---|---|
| 4 | Learn in hot start. | (1) CVT fluid temperature adjustment | ⚠ CAUTION **When CVT fluid temperature is not increased up to 80°C in cold regions, this step should be performed after the CVT fluid temperature has been increased as high as possible.** Increase the CVT fluid temperature up to 80°C. |
| | | (2) Garage shift learn* | Same as in cold start. |
| | | (3) Line pressure and shift control learn | Same as in cold start. |
| | | (4) Direct-connection control learn. | Same as in cold start. |

## DIAGNOSIS FUNCTION

M1231219000101

## N RANGE LAMP SYSTEM




AC509404AB

If there is a problem with any of the CVT system, the N range lamp will flash at a rate of approximately once per second.
If the N range lamp is flashing at a rate of approximately once per second, check the diagnosis output.

### N RANGE LAMP FLASHING ITEM

| |
|---|
| Individual speed sensor systems |
| Line pressure sensor system |
| Primary pressure sensor system |
| Individual solenoid valve systems |
| Shift system |
| CVT control relay system |
| CVT fluid temperature sensor system |

*NOTE: If the "N" range lamp is flushing approximately twice per second, the CVT fluid temperature is high. (It flushes when the fluid is approximately 145°C or more and goes off when the fluid is approximately 135°C or less).*

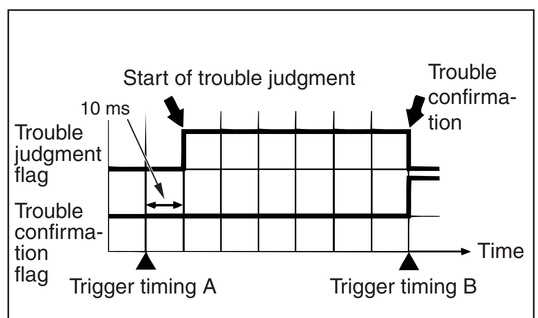
## METHOD OF READING THE DIAGNOSIS CODE

Use the M.U.T.-III to read the diagnosis code (Refer to GROUP 00 − How to Use Troubleshooting/Inspection Service Points P.00-7).

## METHOD OF ERASING THE DIAGNOSIS CODE

Use the M.U.T.-III to erase the diagnosis code (Refer to GROUP 00 − How to Use Troubleshooting/Inspection Service Points P.00-7).

## FREEZE FRAME DATA CHECK




AC207750 AB

If the engine-CVT-ECU detects a malfunction and then sets a diagnosis code, it memorises the current CVT condition by obtaining the data which is created before (trigger timing A in the left figure) and when (trigger timing B) the diagnosis code is set. Troubleshooting can be carried out effectively by using the M.U.T.-III to analyse the data.

The freeze-frame data items are as follows.

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**Data Item List**

| Item No. | M.U.T.-III Display | Data item | Unit |
|---|---|---|---|
| 01 | CRANK A. SNSR | Crank angle sensor | r/min |
| 02 | TURBIN SPEED | Turbine speed sensor | r/min |
| 03 | PRIMARY SPEED | Primary speed sensor | r/min |
| 04 | 2NDARY SPEED | Secondary speed sensor | r/min |
| 06 | APS | Accelerator pedal position sensor (APS) | mV |
| 07 | INFO. Pe1 | Engine target average effective pressure | MPa |
| 08 | OIL TEMP. SNSR | CVT fluid temperature sensor | °C |
| 09 | LINE PRESS. | Line pressure sensor | MPa |
| 11 | PRIMARY PRESS | Primary pressure sensor | MPa |
| 13 | INFO. Pe2 | Engine output average effective pressure | MPa |
| 14 | DCC SOL. DUTY | Duty ratio of damper clutch control solenoid | % |
| 15 | SHIFT SOL. D. | Duty ratio of shift control solenoid | % |
| 16 | LINE SOL. DUTY | Duty ratio of line pressure control solenoid | % |
| 17 | CLUTCH SOL. D. | Duty ratio of clutch pressure control solenoid | % |
| 26 | INHIBITOR SW | Inhibitor switch | – |
| 33 | STOP LAMP SW | Stop lamp switch | – |
| 36 | INFO. PRM. PRS | Target primary pressure | MPa |
| 38 | INFO. LINE. PRS. | Target line pressure | MPa |
| 3B | INFO. PRM. REV. | Target primary speed | r/min |

## ROAD TEST

M1231207800111

| Procedure | Pre-test/ operation conditions | Test/Operation | Judgment value | Check item | Diagnosis code No. | Inspection procedure if there is an abnormality |
|---|---|---|---|---|---|---|
| 1 | Ignition switch: LOCK (OFF) position | Ignition switch<br>(1) ON | Data List No.25<br>(1) System voltage [V] | CVT control relay | 56 | CVT control relay system |
| 2 | • Ignition switch: ON<br>• Engine: Stopped | Selector lever position<br>(1) P<br>(2) R<br>(3) N<br>(4) D<br>(5) Ds<br>(6) L | Data List No.26<br>(1) P<br>(2) R<br>(3) N<br>(4) D<br>(5) Ds<br>(6) L | Inhibitor switch | 51, 52 | Inhibitor switch system |

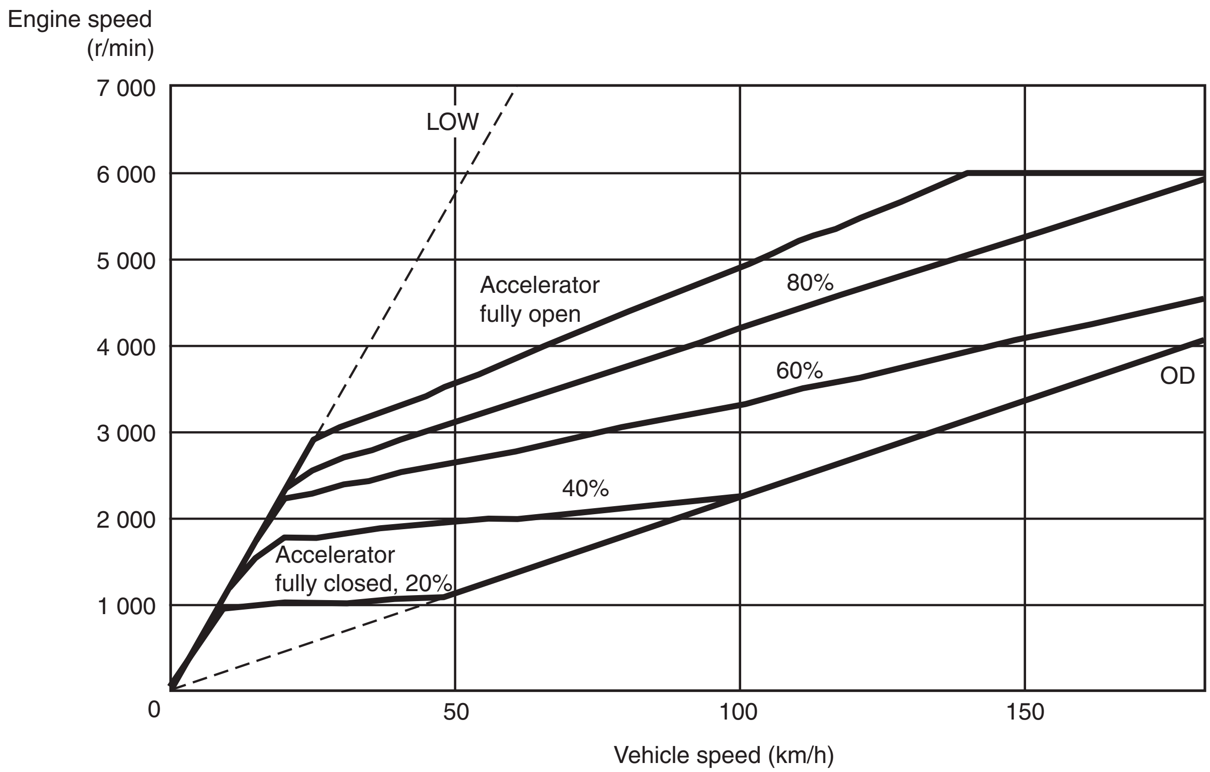
| Procedure | Pre-test/ operation conditions | Test/Operation | Judgment value | Check item | Diagnosis code No. | Inspection procedure if there is an abnormality |
|---|---|---|---|---|---|---|
| 3 | • Ignition switch: ON<br>• Engine: Stopped<br>• Selector lever position: P | Accelerator pedal<br>(1) Fully closed<br>(2) Depressed<br>(3) Fully opened | Data List No.06<br>(1) 800 – 1,200 mV<br>(2) Gradually increases from (1)<br>(3) 4,000 mV or more | APS | – | Refer to GROUP 13A – Troubleshooting P.13A-20. |
| | | Brake pedal<br>(1) Depressed<br>(2) Released | Data List No.33<br>(1) ON<br>(2) OFF | Stop lamp switch | 53, 54 | Stop lamp switch system |
| 4 | Ignition switch: START | Starting test at P or N position | Starting should be possible | Starting possible/not possible | – | Starting not possible |
| 5 | Driving after engine has warmed up | Drive for 15 minutes or more until the CVT fluid temperature rises to 45 – 100°C | Data List No.08<br>Gradually rises to 45 – 100°C | CVT fluid temperature sensor | 15, 16 | CVT fluid temperature sensor system |
| 6 | Engine: idle<br>Selector lever position: P | Accelerator pedal: Fully closed | Data List No.01<br>600 – 800 r/min | Engine speed | – | Refer to GROUP 13A – Troubleshooting P.13A-20. |
| | | | Data List No.02<br>600 – 800 r/min | Turbine speed | 22 | Turbine speed sensor system |
| | | | Data List No.09<br>0.6 – 1.5 MPa | Line pressure sensor | 18, 19 | Line pressure sensor system |
| | | | Data List No.11<br>0 – 0.6 MPa | Primary pressure sensor | 27, 28 | Primary pressure sensor system |
| | | | Data List No.12<br>2.313 | Gear ratio | 23, 26 | Primary speed sensor system |
| | | | | | 24, 25 | Secondary speed sensor system |
| | | | Data List No.16<br>70 – 90% | Line pressure control solenoid valve | 31 | Line pressure control solenoid valve system |

| Procedure | Pre-test/ operation conditions | Test/Operation | Judgment value | Check item | Diagnosis code No. | Inspection procedure if there is an abnormality |
|---|---|---|---|---|---|---|
| 7 | Engine: idle | Selector lever position<br>(1) N → D<br>(2) N → R | • No abnormal shift shock detected<br>• Time lag within 2 seconds | Fault during shift | – | Engine stall during shift |
| | | | | | – | Shock during N → D or N → R shift operation |
| | | | | Not possible to drive | – | Not possible to drive |
| | | | Data List No.17 Changed to 99.6% → 0% | Clutch pressure control solenoid valve | 34, 38 | Clutch pressure control solenoid valve system |
| | | Selector lever position: N → D | Data List No.10 Changed to less than 20 → 408 r/min | Damper clutch | – | – |
| 8 | Selector lever position: D | Constant driving at 50 km/h on flat road from standstill | Data List No.14 Changed to 0% → 35% or more | Damper clutch control solenoid valve | 33, 37 | Damper clutch control solenoid valve system |
| | | Constant driving at 50 km/h on flat road | Data List No.10 Less than 40 r/min | Damper clutch | – | – |
| | | • During driving<br>• Selector lever position<br>(1) D → Ds<br>(2) Ds → D | Data List No.15<br>(1) Value increases momentarily.<br>(2) Value decreases momentarily. | Shift control solenoid valve | 32, 36 | Shift control solenoid valve system |

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## RATIO PATTERN

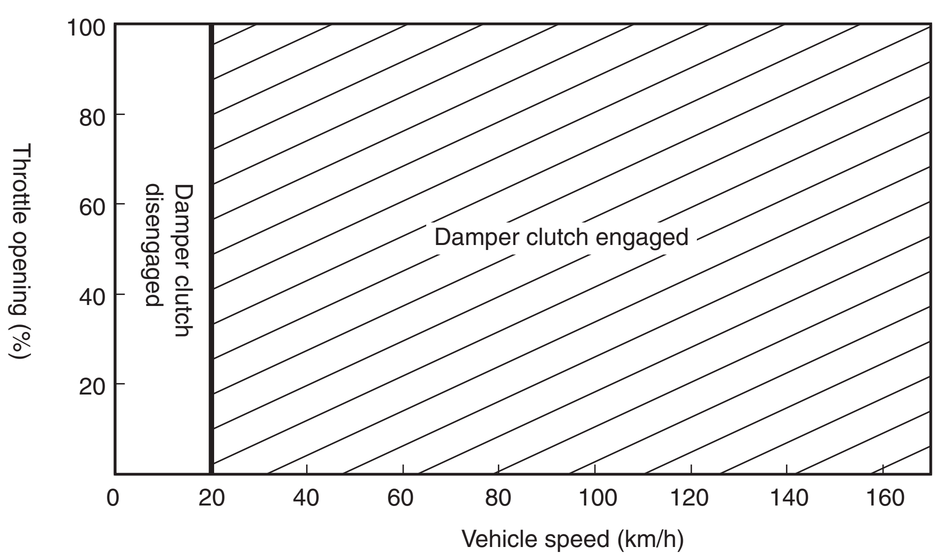
M1231202600134




AC403740AD

## DAMPER CLUTCH CONTROL

M1231204100050




AC207742AB

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## INSPECTION CHART FOR DIAGNOSIS CODES

M1231207900163

⚠ CAUTION

**During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.**

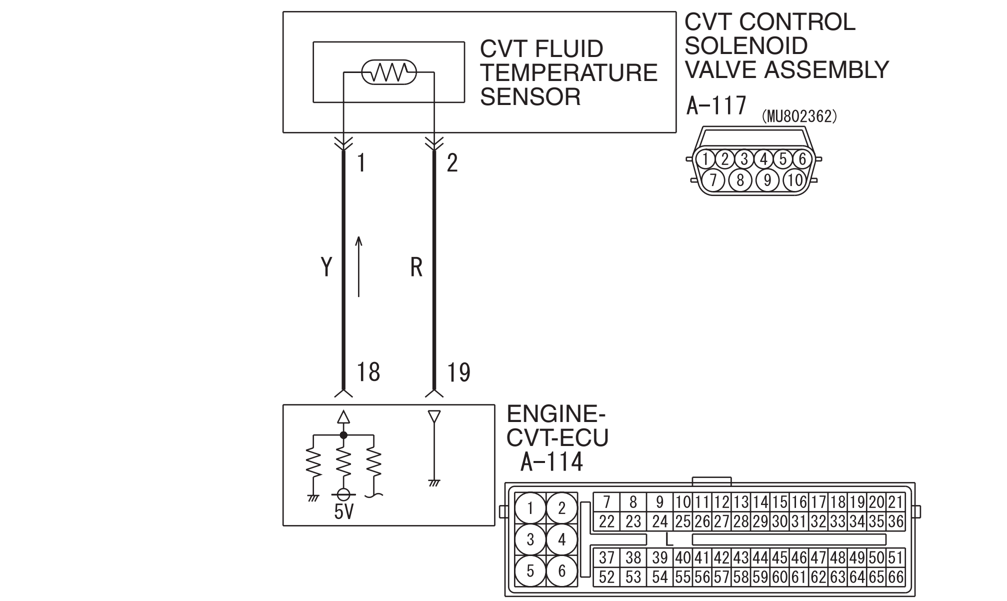
| Diagnosis code No. | Diagnosis item | Reference page |
|---|---|---|
| 15 | CVT fluid temperature sensor system | P.23A-15 |
| 16 | | |
| 18 | Line pressure sensor system | P.23A-21 |
| 19 | | |
| 22 | Turbine speed sensor system | P.23A-29 |
| 23 | Primary speed sensor system | P.23A-37 |
| 26 | | |
| 24 | Secondary speed sensor system | P.23A-53 |
| 25 | | |
| 27 | Primary pressure sensor system | P.23A-69 |
| 28 | | |
| 31 | Line pressure control solenoid valve system | P.23A-77 |
| 32 | Shift control solenoid valve system | P.23A-82 |
| 36 | | |
| 33 | Damper clutch control solenoid valve system | P.23A-86 |
| 37 | | |
| 34 | Clutch pressure control solenoid valve system | P.23A-90 |
| 38 | | |
| 42 | Fail system of shift system | P.23A-94 |
| 44 | Fail system of damper clutch system | P.23A-95 |
| 45 | | |
| 46 | Fail system of clutch system | P.23A-95 |
| 48 | | |
| 51 | Inhibitor switch system | P.23A-95 |
| 52 | | |
| 53 | Stop lamp switch system | P.23A-101 |
| 54 | | |
| 56 | CVT control relay system | P.23A-106 |
| 59 | Steel belt system | P.23A-112 |
| 57 | Fail system of line pressure system | P.23A-113 |
| 71 | | |
| 72 | | |

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# INSPECTION PROCEDURES FOR DIAGNOSIS CODE

## Code No.15, 16 CVT Fluid Temperature Sensor System

CVT Fluid Temperature Sensor System Circuit




AC405416

### OPERATION

- The CVT fluid temperature sensor converts the transmission fluid temperature into voltage signal, and then sends it to the engine-CVT-ECU.
- The CVT fluid temperature sensor resistance increases when the fluid temperature is low, and decreases when it is high.

### DIAGNOSIS CODE SET CONDITIONS

- Code No.15 will be set if the CVT fluid temperature sensor output voltage is 4.5V or more (fluid temperature is approximately –28°C or less) after driving the vehicle for 1 minute or more.
- Code No.16 will be set if the CVT fluid temperature sensor output voltage is 0.25 V or less (fluid temperature is approximately 200°C or more)

### PROBABLE CAUSES

- Malfunction of the CVT fluid temperature sensor
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

### DIAGNOSIS PROCEDURE

**STEP 1. M.U.T.-III data list**

Item 08: CVT fluid temperature sensor (Refer to Data List Table P.23A-123).

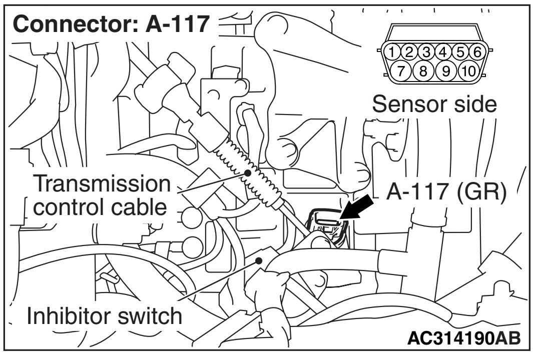
**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Go to Step 2.

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### STEP 2. Measure the resistance at CVT control solenoid valve assembly connector A-117.




Disconnect the connector, and measure the resistance between terminal 1 and 2 at the sensor side.

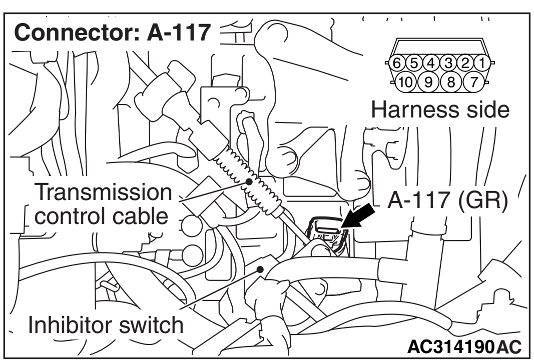
**OK:**

- **16.7 – 20.5 kΩ (CVT fluid temperature at 0°C)**
- **7.3 – 8.9 kΩ (CVT fluid temperature at 20°C)**
- **3.4 – 4.2 kΩ (CVT fluid temperature at 40°C)**
- **1.9 – 2.2 kΩ (CVT fluid temperature at 60°C)**
- **1.0 – 1.2 kΩ (CVT fluid temperature at 80°C)**
- **0.57 – 0.69 kΩ (CVT fluid temperature at 100°C)**

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Replace the CVT fluid temperature sensor. (Refer to P.23A-155).

### STEP 3. Connector check: A-117 CVT control solenoid valve assembly connector.

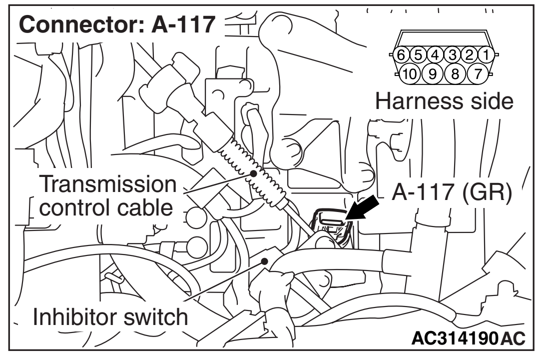



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Repair the defective connector.

### STEP 4. Measure the resistance at CVT control solenoid valve assembly connector A-117.




Disconnect the connector, and measure the resistance between terminal 2 and earth at the wiring harness side.

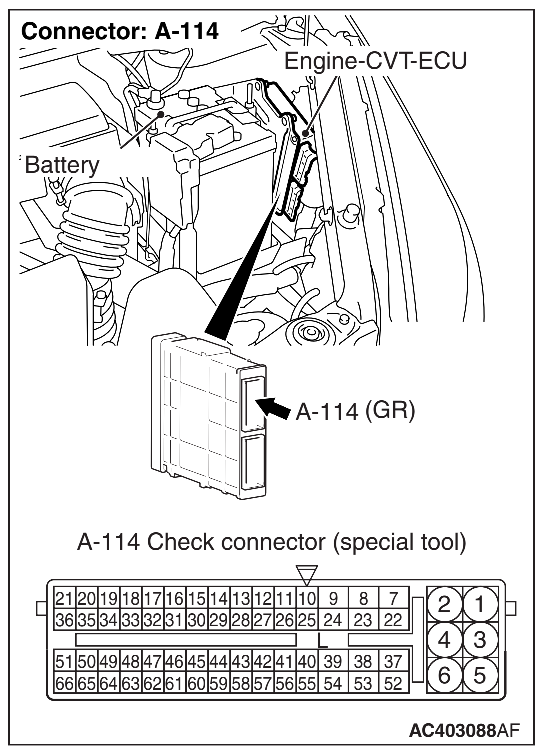
**OK: 2 Ω or less**

**Q: Is the check result normal?**

**YES :** Go to Step 10.
**NO :** Go to Step 5.

### STEP 5. Measure the voltage at engine-CVT-ECU connector A-114.

(1) Connect CVT control solenoid valve assembly connector A-117.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.

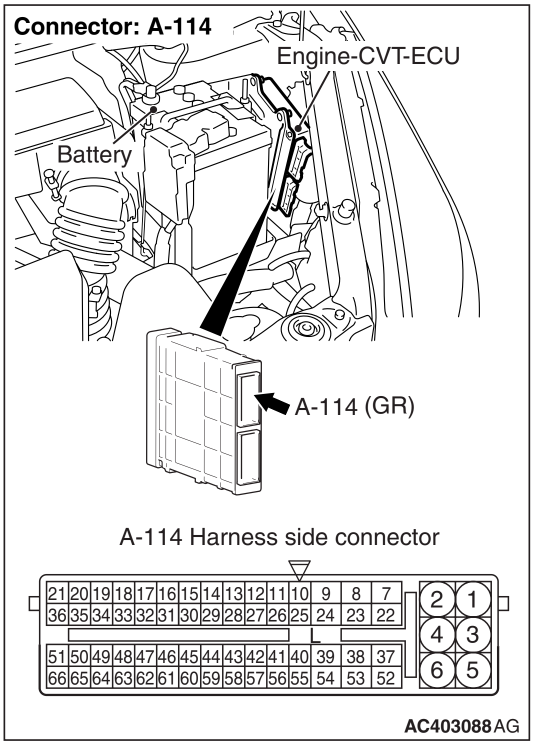
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(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.19 and earth.

**OK: 0.5 V or less**

**Q: Is the check result normal?**
**YES :** Go to Step 8.
**NO :** Go to Step 6.

### STEP 6. Connector check: A-114 engine-CVT-ECU connector.




Check for the contact with terminals.

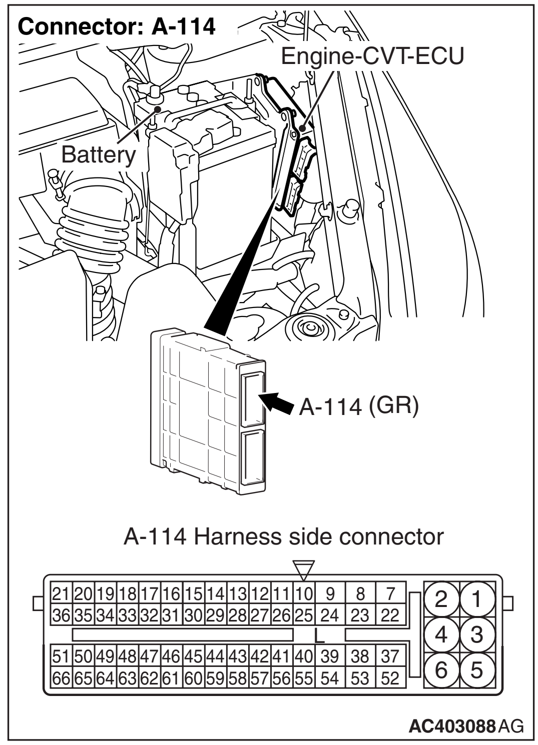
**Q: Is the check result normal?**
**YES :** Go to Step 7.
**NO :** Repair the defective connector.

### STEP 7. M.U.T.-III data list

Item 08: CVT fluid temperature sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**
**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

### STEP 8. Connector check: A-114 engine-CVT-ECU connector.

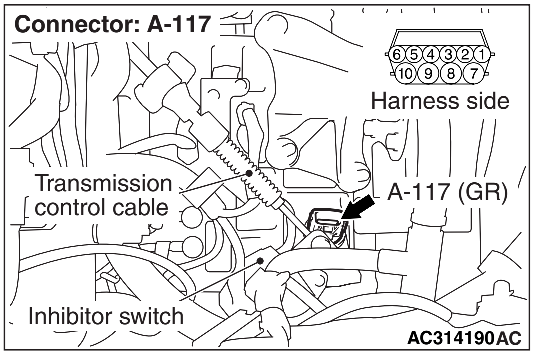


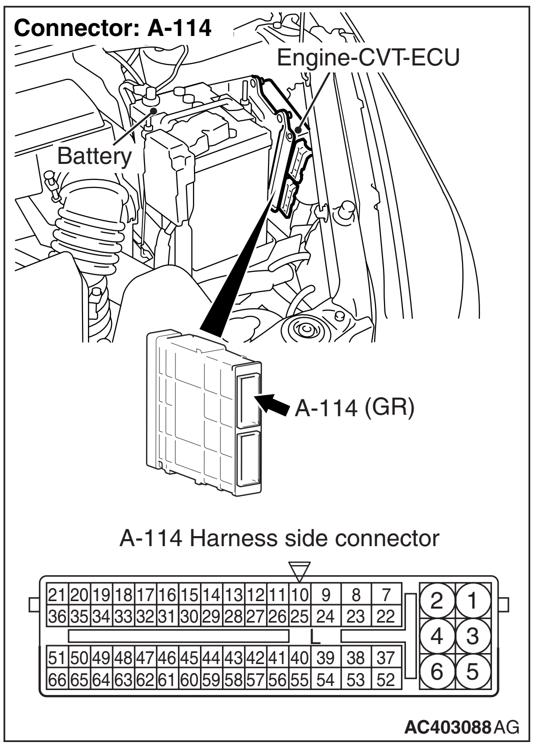

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 9.
**NO :** Repair the defective connector.

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**STEP 9. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.19.**



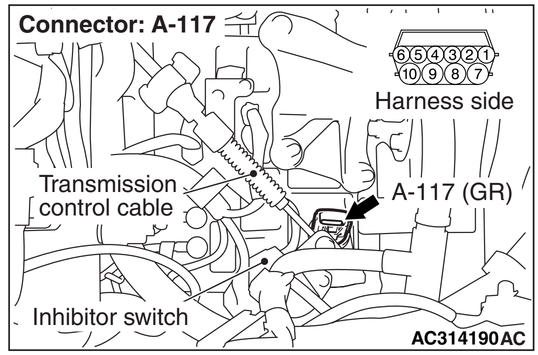

Check the earth line for open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 7.

**NO :** Repair the wiring harness.

**STEP 10. Measure the voltage at CVT control solenoid valve assembly connector A-117.**




(1) Disconnect the connector, and measure the voltage between terminal 1 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: 4.5 – 4.9 V**

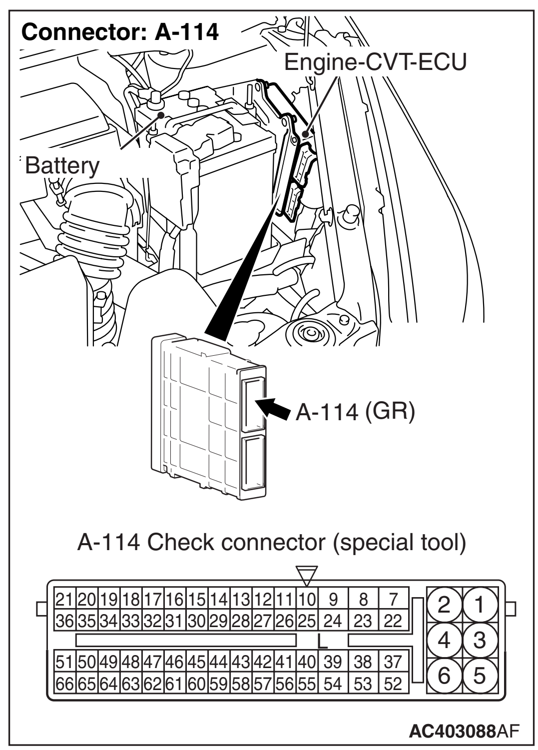
**Q: Is the check result normal?**

**YES :** Go to Step 7.

**NO :** Go to Step 11.

**STEP 11. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect CVT control solenoid valve assembly connector A-117.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.

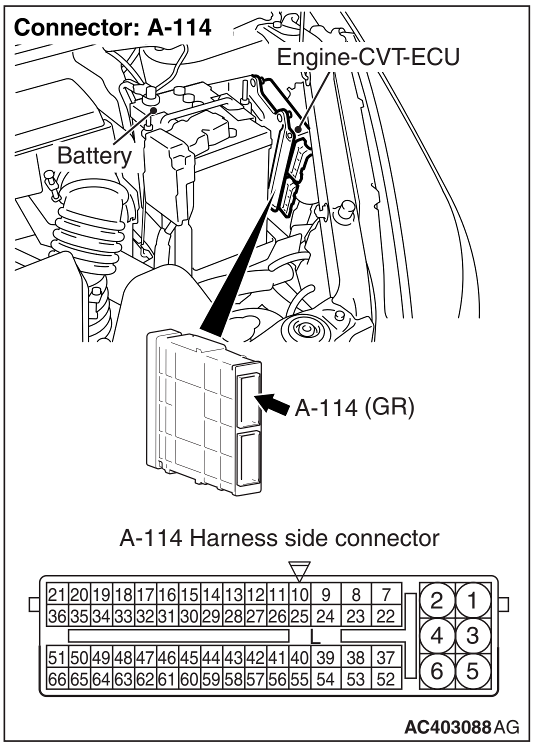
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(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.18 and earth.

**OK:**
- **3.8 – 4.0 V (CVT fluid temperature at 20°C)**
- **3.2 – 3.4 V (CVT fluid temperature at 40°C)**
- **1.7 – 1.9 V (CVT fluid temperature at 80°C)**

**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Go to Step 13.

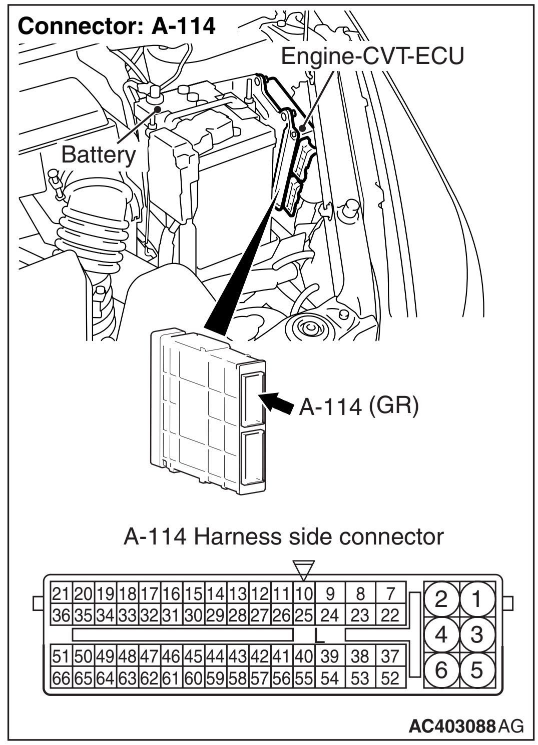
### STEP 12. Connector check: A-114 engine-CVT-ECU connector.




Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 7.
**NO :** Repair the defective connector.

### STEP 13. Connector check: A-114 engine-CVT-ECU connector.

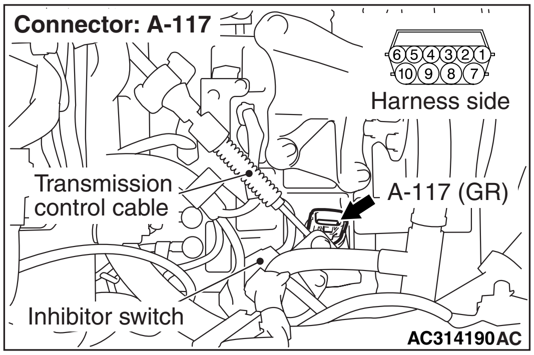


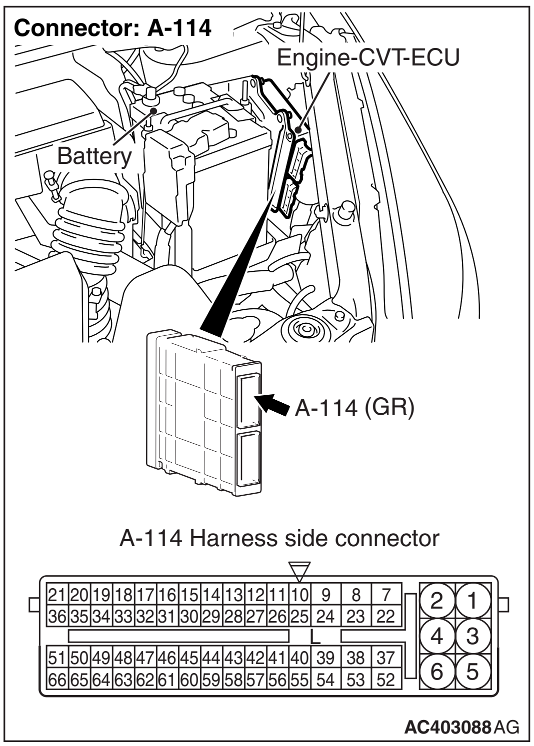

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 14.
**NO :** Repair the defective connector.

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**STEP 14. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.18.**




Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**

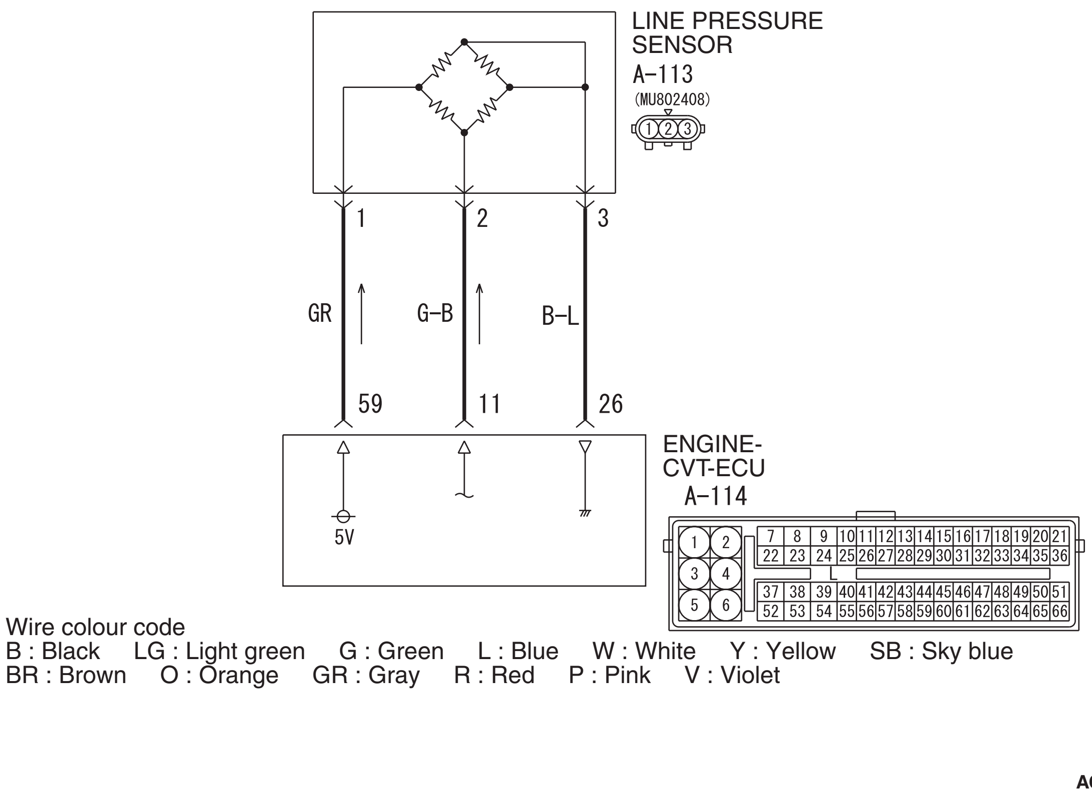
**YES :** Go to Step 7.

**NO :** Repair the wiring harness.

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## Code No.18, 19 Line Pressure Sensor System

Line Pressure Sensor System Circuit




## OPERATION

The line pressure sensor detects the fluid pressure applied to the secondary pulley, and sends the information to the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

- If the line pressure sensor output voltage is 0.2 V or less while the engine is running (engine speed is 450 r/min or more, and the relay voltage is 10 V or more), code No.18 will be set.
- If the line pressure sensor output voltage is 4.7 V or more (fluid pressure is approximately 6.8 MPa or more) while the engine is idling (engine speed is 450 – 1,000 r/min, and the relay voltage is 10 V or more, code No.19 will be set.

## PROBABLE CAUSES

- Malfunction of line pressure sensor
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III data list

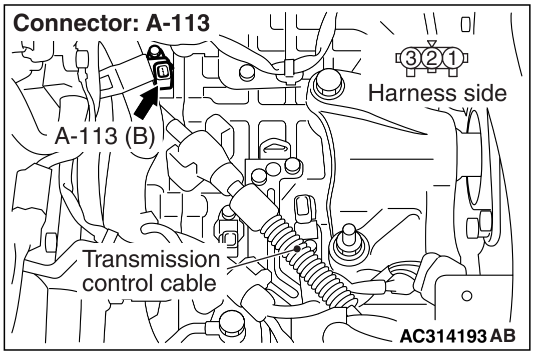
Item 09: Line pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Go to Step 2.

**STEP 2. Connector check: A-113 line pressure sensor connector.**



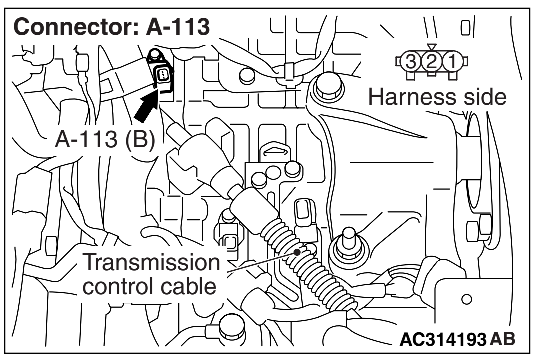

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 3.

**NO :** Repair the defective connector.

**STEP 3. Measure the resistance at line pressure sensor connector A-113.**




Disconnect the connector, and measure the resistance between terminal 3 and earth at the wiring harness side.

**OK: 2 Ω or less**

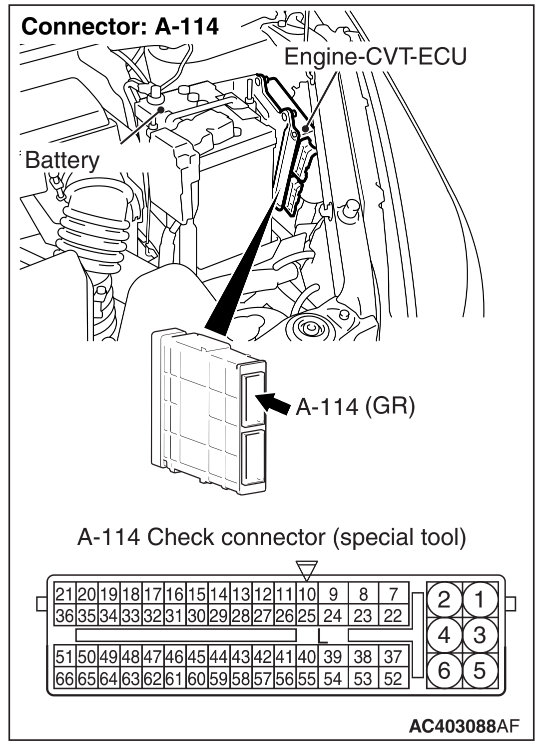
**Q: Is the check result normal?**

**YES :** Go to Step 9.

**NO :** Go to Step 4.

**STEP 4. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect line pressure sensor connector A-113.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.26 and earth.

**OK: 0.5 V or less**

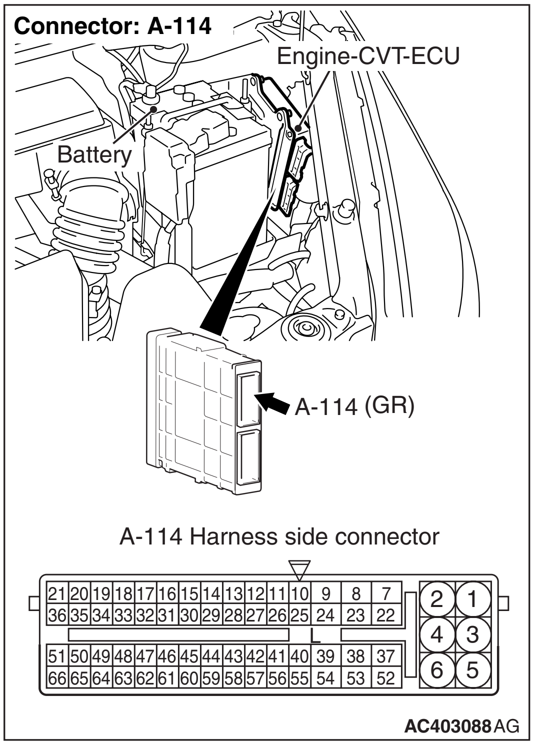
**Q: Is the check result normal?**

**YES :** Go to Step 7.

**NO :** Go to Step 5.

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### STEP 5. Connector check: A-114 engine-CVT-ECU connector.




Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the defective connector.

### STEP 6. M.U.T.-III data list

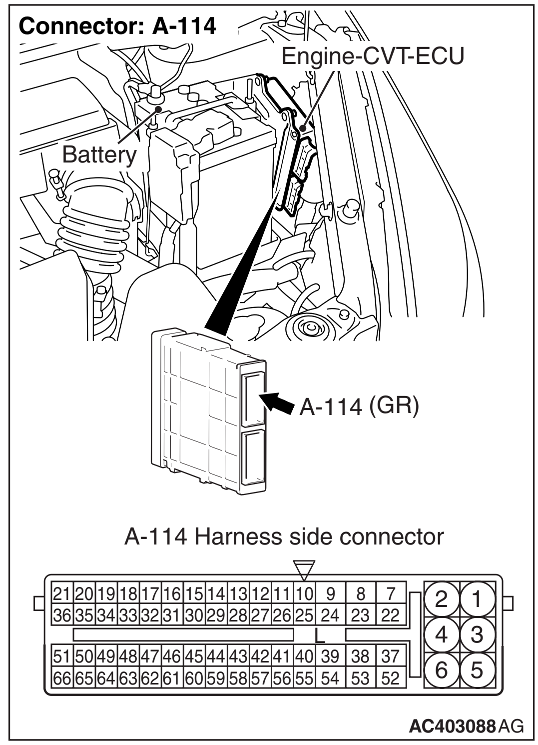
Item 09: Line pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Replace the engine-CVT-ECU.

### STEP 7. Connector check: A-114 engine-CVT-ECU connector.




Check for the contact with terminals.

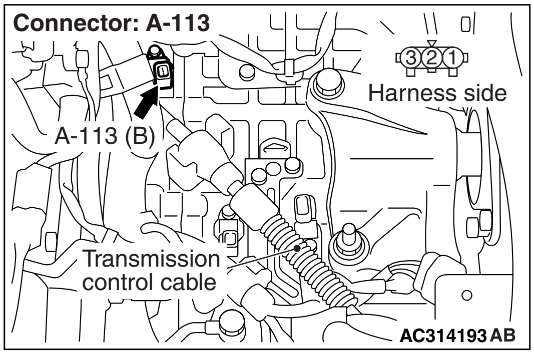
**Q: Is the check result normal?**

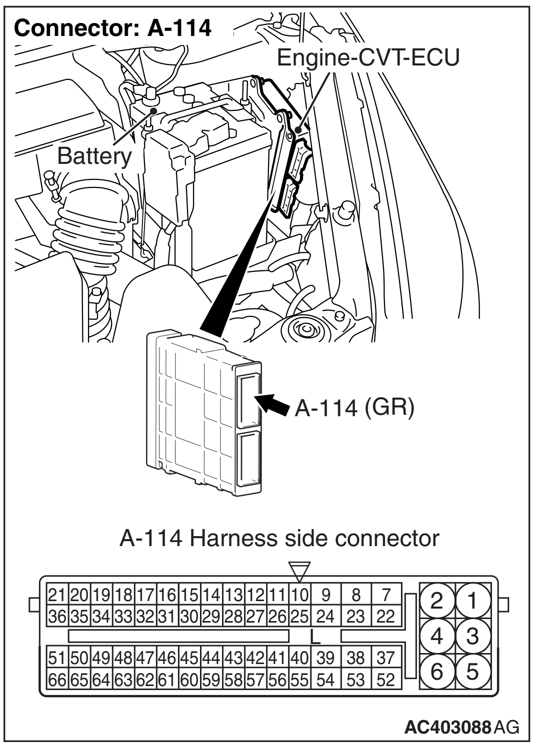
**YES :** Go to Step 8.

**NO :** Repair the defective connector.

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**STEP 8. Check the harness between line pressure sensor connector A-113 terminal No.3 and engine-CVT-ECU connector A-114 terminal No.26.**



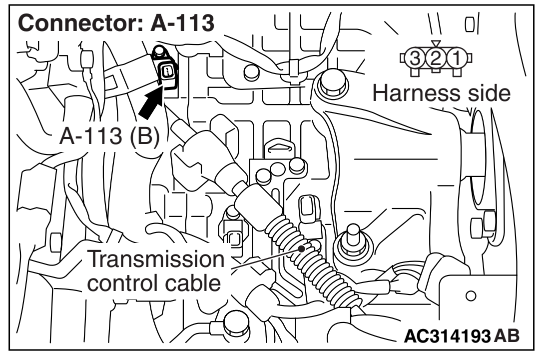

Check the earth line for open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

**STEP 9. Measure the voltage at line pressure sensor connector A-113.**




(1) Disconnect the connector, and measure the voltage between terminal 1 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: 4.9 – 5.1 V**

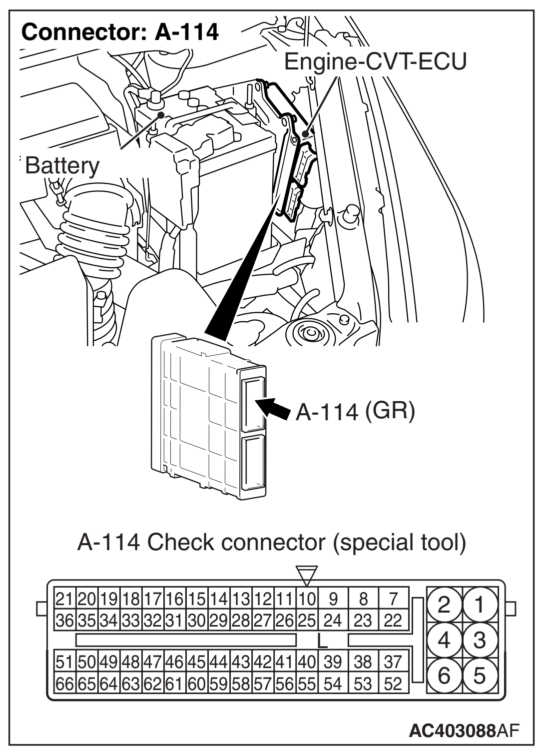
**Q: Is the check result normal?**

**YES :** Go to Step 15.

**NO :** Go to Step 10.

**STEP 10. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect line pressure sensor connector A-113.



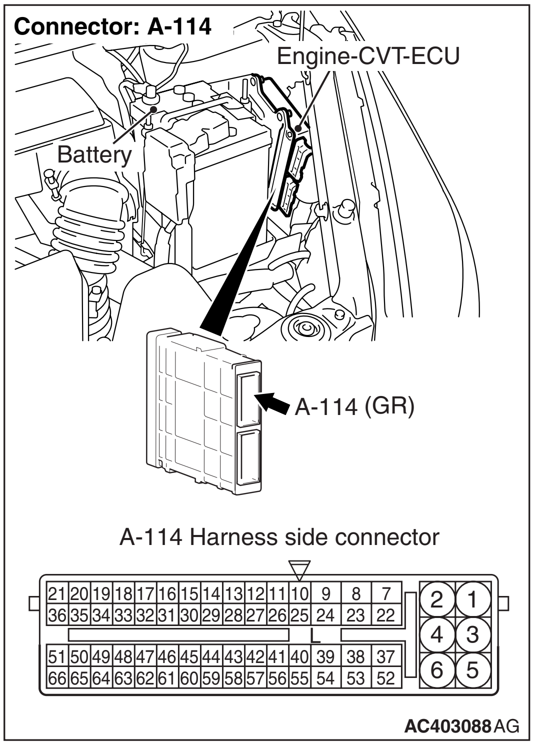

(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.59 and earth.

**OK: 4.9 – 5.1 V**

**Q: Is the check result normal?**
**YES :** Go to Step 11.
**NO :** Go to Step 13.

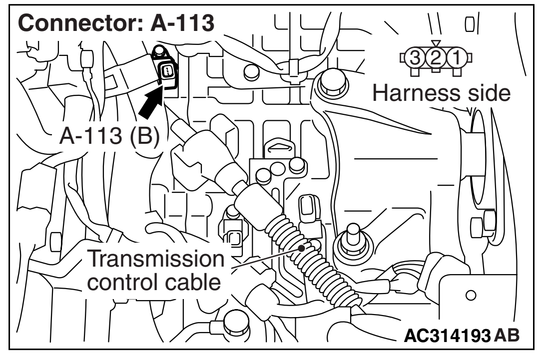
**STEP 11. Connector check: A-114 engine-CVT-ECU connector.**

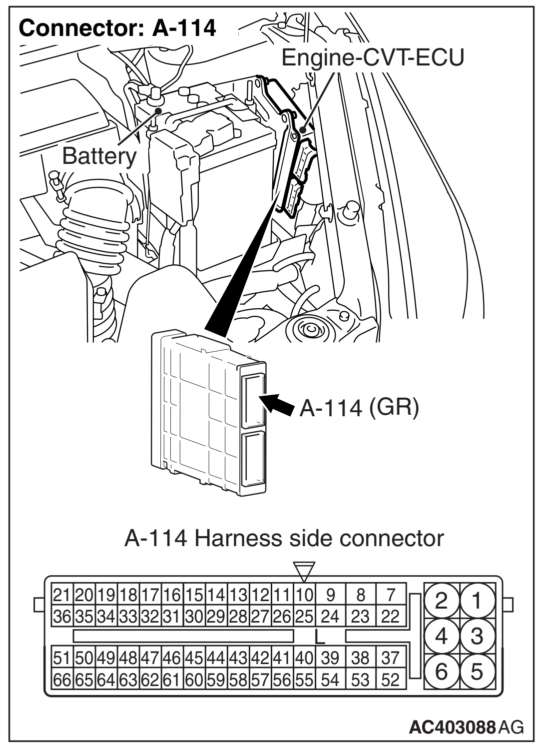



Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Repair the defective connector.

**STEP 12. Check the harness between line pressure sensor connector A-113 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.59.**



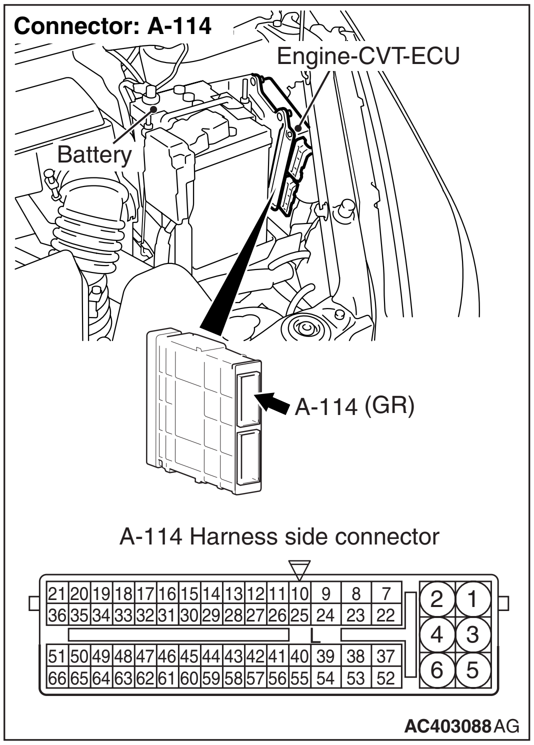




Check the power supply line for open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Repair the wiring harness.

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### STEP 13. Connector check: A-114 engine-CVT-ECU connector.



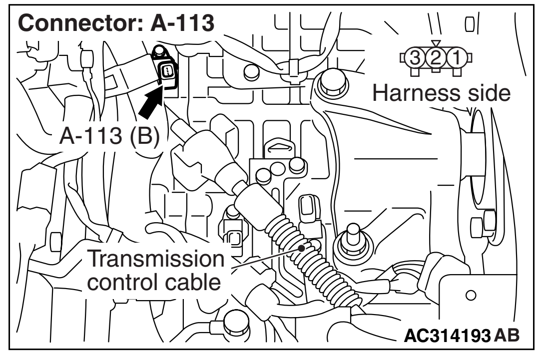

Check for the contact with terminals.

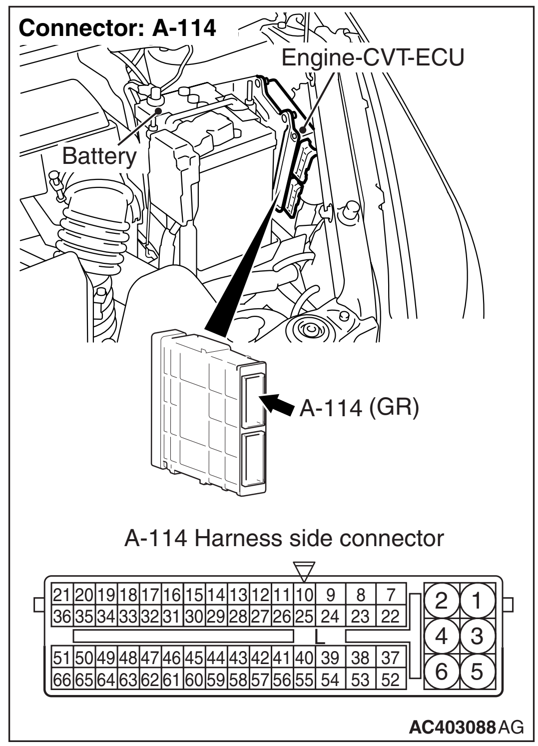
**Q: Is the check result normal?**

**YES :** Go to Step 14.

**NO :** Repair the defective connector.

### STEP 14. Check the harness between line pressure sensor connector A-113 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.59.




Check the power supply line for short-circuited.

**Q: Is the check result normal?**

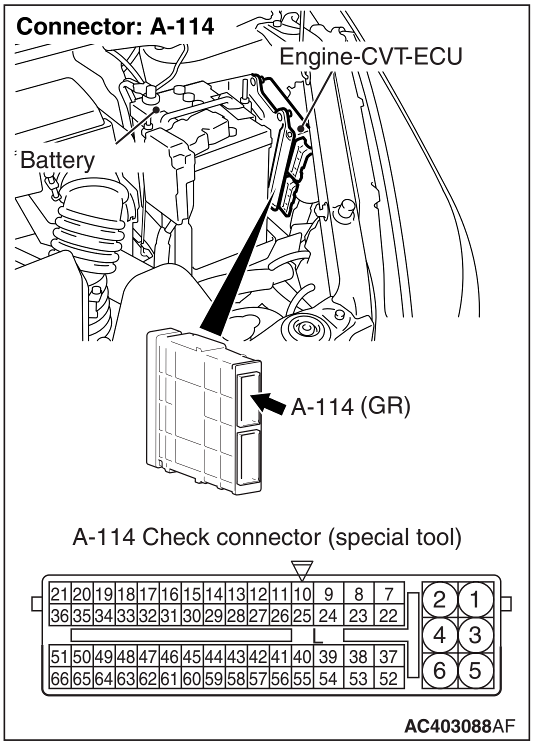
**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

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**STEP 15. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect line pressure sensor connector A-113.

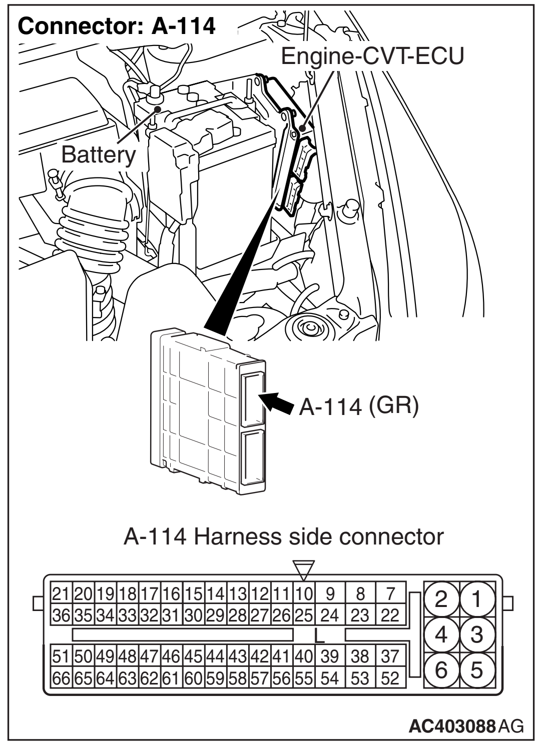



(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Let the engine run at idle.
(4) Shift the selector lever to the P range.
(5) Close the accelerator pedal fully.
(6) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.11 and earth.

**OK: 0.9 – 1.4 V**

**Q: Is the check result normal?**
**YES : .** Go to Step 18.
**NO : .** Go to Step 16.

**STEP 16. Connector check: A-114 engine-CVT-ECU connector.**

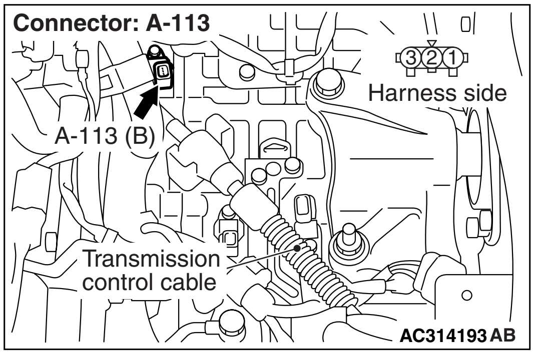


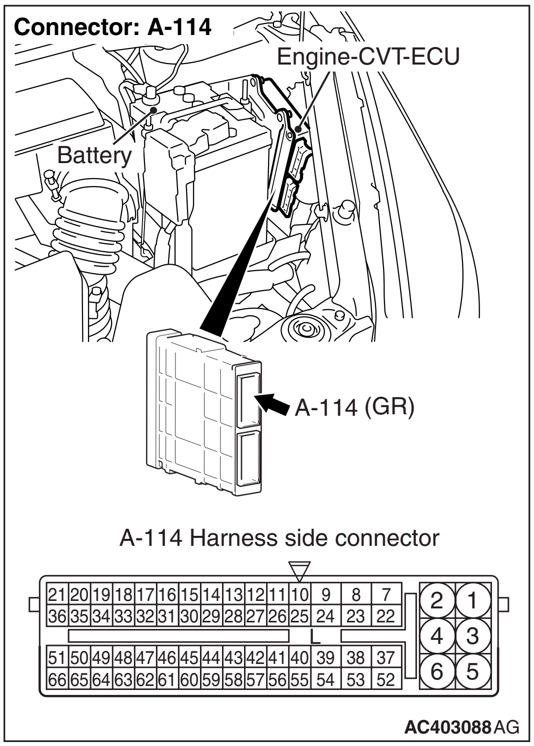

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 17.
**NO :** Repair the defective connector.

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**STEP 17. Check the harness between line pressure sensor connector A-113 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.11.**

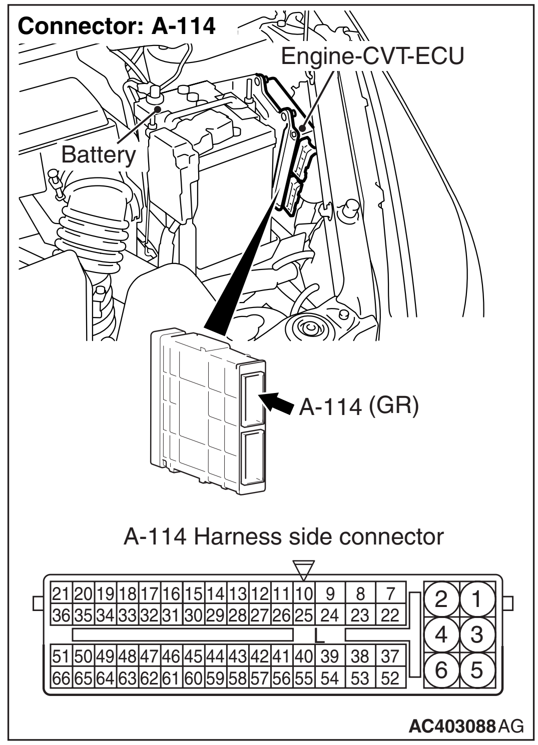



Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**
**YES :** Replace the line pressure sensor. (Refer to P.23A-155).
**NO :** Repair the wiring harness.

**STEP 18. Connector check: A-114 engine-CVT-ECU connector.**



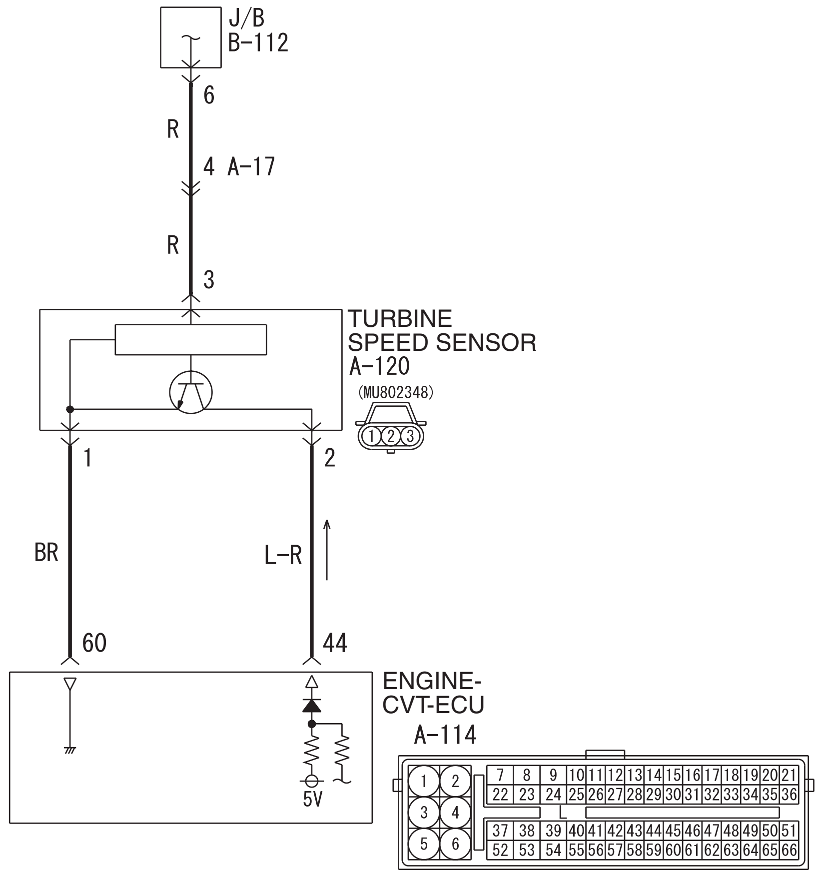

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Repair the defective connector.

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## Code No.22 Turbine Speed Sensor System

Turbine Speed Sensor System Circuit




Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

AC405420 AB

## OPERATION

The turbine speed sensor detects the forward clutch retainer speed, and sends the signal to the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

Code No.22 will be set if the turbine speed sensor signal can not be detected while the vehicle is driven (engine speed is 450 r/min or more, and primary speed is 1,000 r/min or more).

## PROBABLE CAUSES

- Malfunction of turbine speed sensor
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU
- Malfunction of forward clutch retainer

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III data list

Item 02: Turbine speed sensor (Refer to Data List Table P.23A-123).

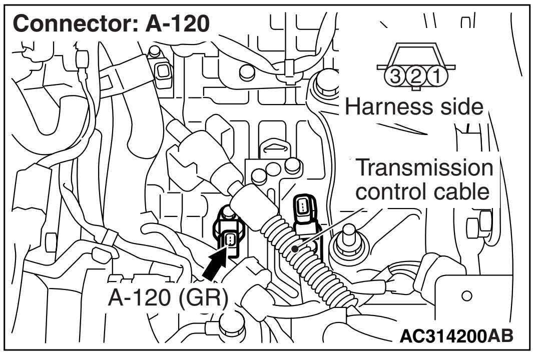
**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Go to Step 2.

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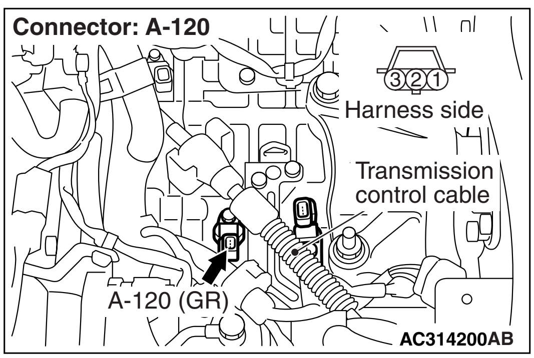
### STEP 2. Connector check: A-120 turbine speed sensor connector.




Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 3.
**NO :** Repair the defective connector.

### STEP 3. Measure the resistance at turbine speed sensor connector A-120.



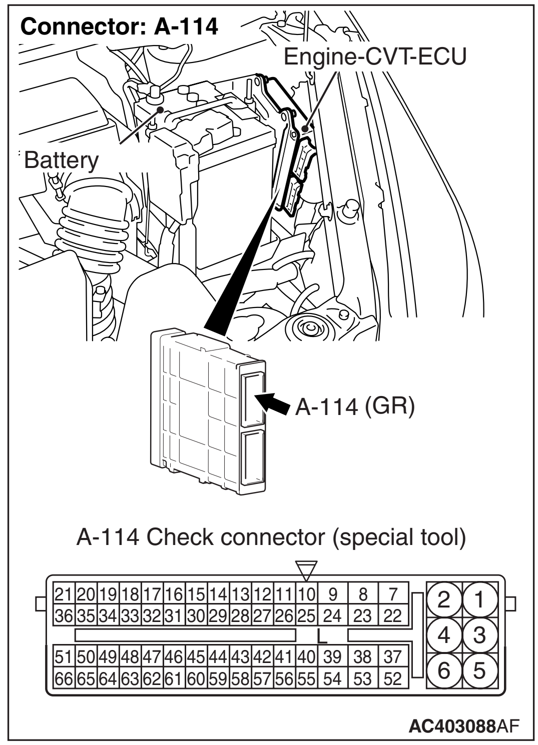

Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.

**OK: 2 Ω or less**

**Q: Is the check result normal?**
**YES :** Go to Step 9.
**NO :** Go to Step 4.

### STEP 4. Measure the voltage at engine-CVT-ECU connector A-114.

(1) Connect turbine speed sensor connector A-120.



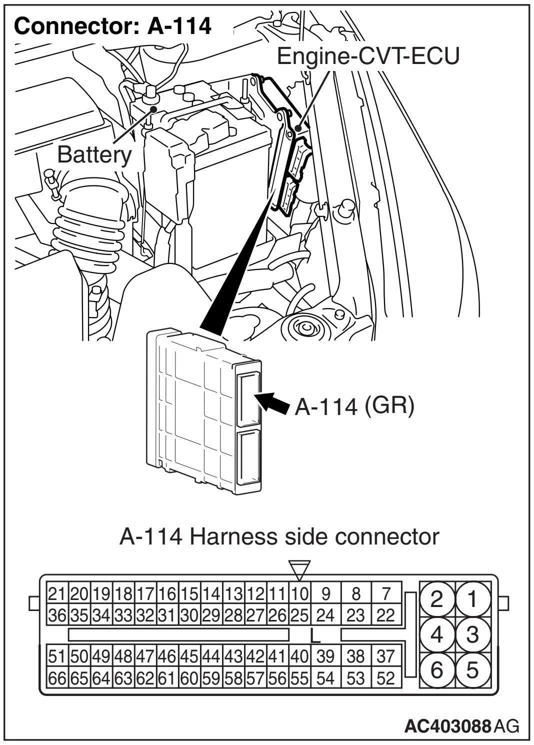

(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.60 and earth.

**OK: 0.5 V or less**

**Q: Is the check result normal?**
**YES :** Go to Step 7.
**NO :** Go to Step 5.

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**STEP 5. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the defective connector.

**STEP 6. M.U.T.-III data list**

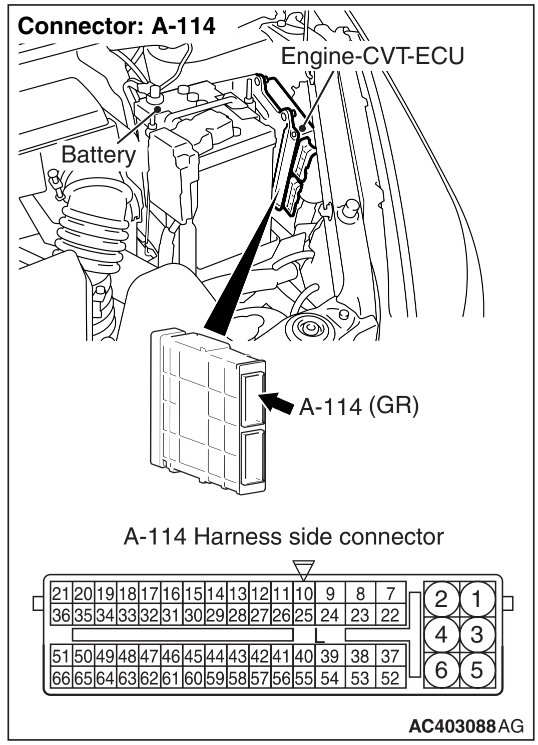
Item 02: Turbine speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Replace the engine-CVT-ECU.

**STEP 7. Connector check: A-114 engine-CVT-ECU connector.**



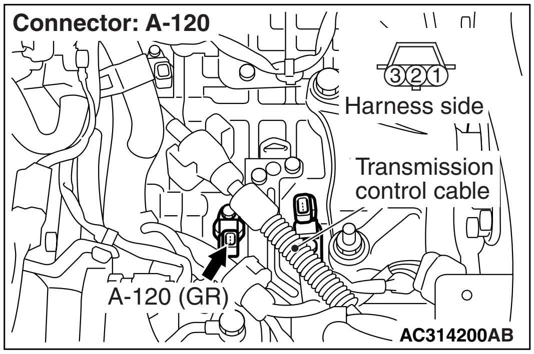

Check for the contact with terminals.

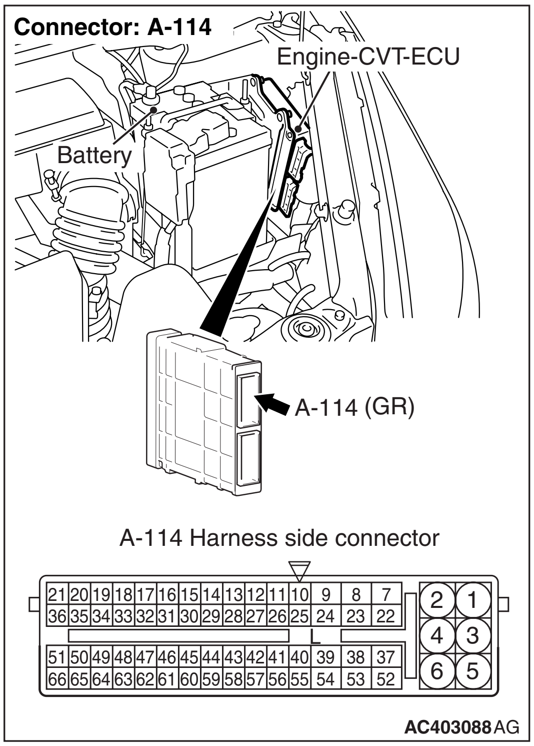
**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Repair the defective connector.

### STEP 8. Check the harness between turbine speed sensor connector A-120 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.60.

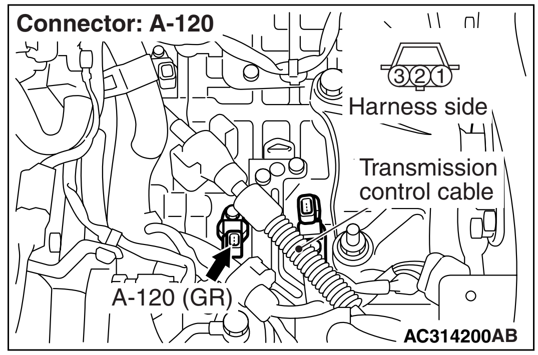



Check the earth line for open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Repair the wiring harness.

### STEP 9. Measure the voltage at turbine speed sensor connector A-120.

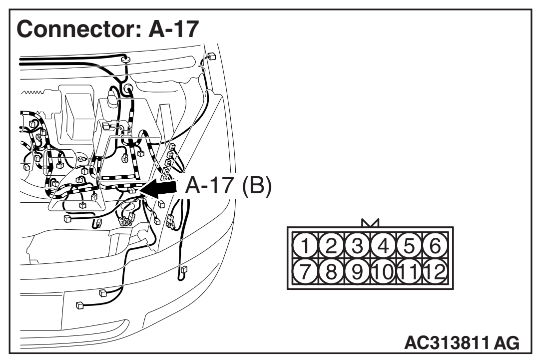


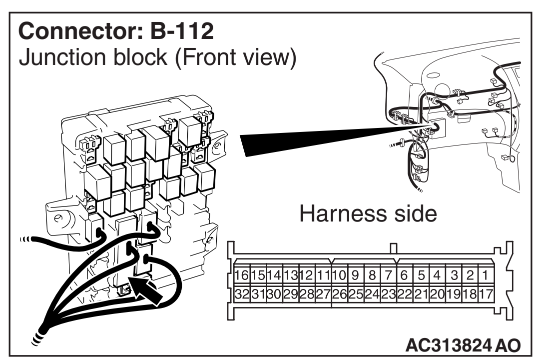

(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: System voltage**

**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Go to Step 10.

### STEP 10. Connectors check: A-17 intermediate connector, B-112 J/B connector.



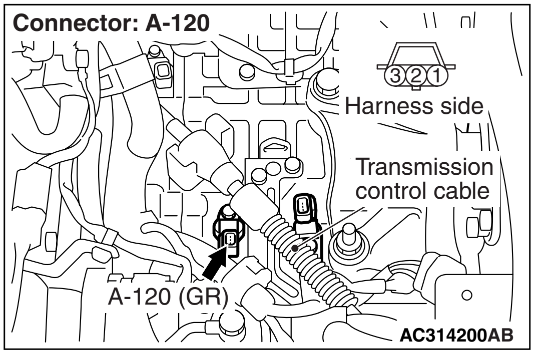



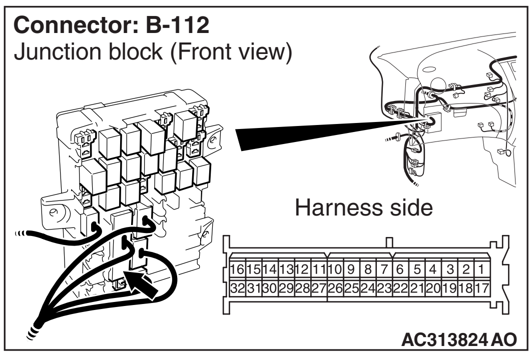

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 11.
**NO :** Repair the defective connector.

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**STEP 11. Check the harness between turbine speed sensor connector A-120 terminal No.3 and J/B connector B-112 terminal No.6.**



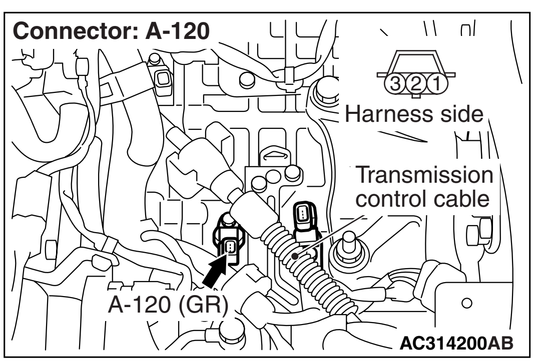

Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

**STEP 12. Measure the voltage at turbine speed sensor connector A-120.**




(1) Disconnect the connector, and measure the voltage between terminal 2 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: 4.9 − 5.1 V**

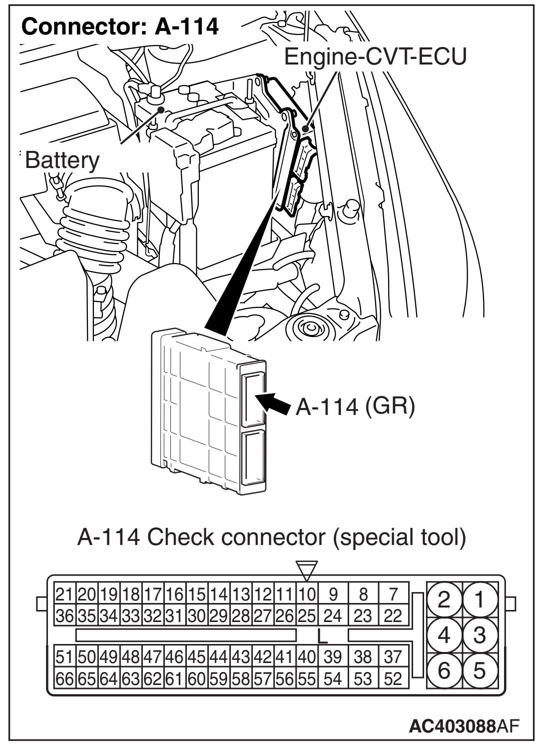
**Q: Is the check result normal?**

**YES : .** Go to Step 18.

**NO : .** Go to Step 13.

**STEP 13. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect turbine speed sensor connector A-120.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.44 and earth.

**OK: 4.9 − 5.1 V**

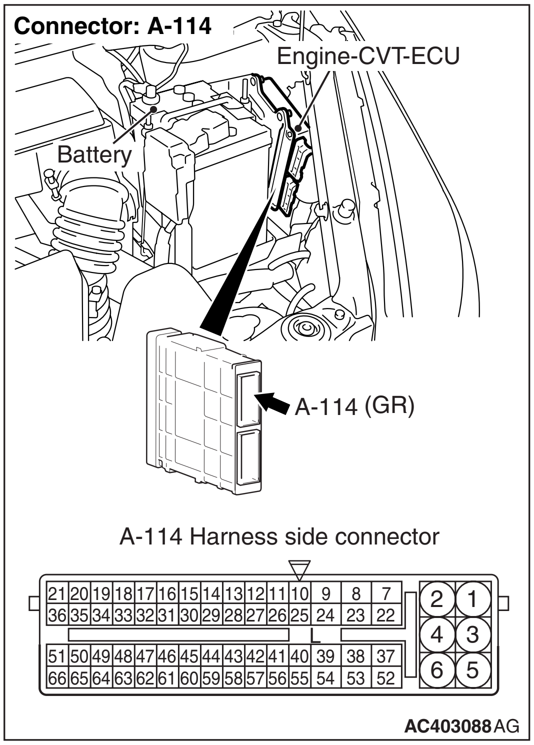
**Q: Is the check result normal?**

**YES :** Go to Step 16.

**NO :** Go to Step 14.

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### STEP 14. Connector check: A-114 engine-CVT-ECU connector.



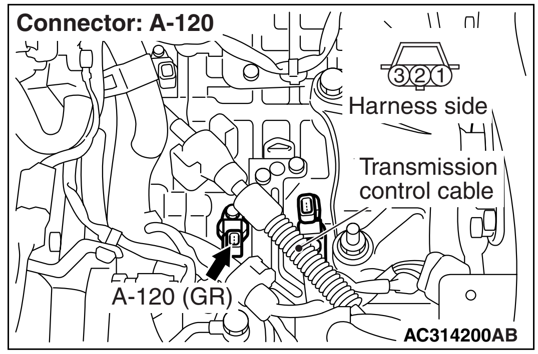

Check for the contact with terminals.

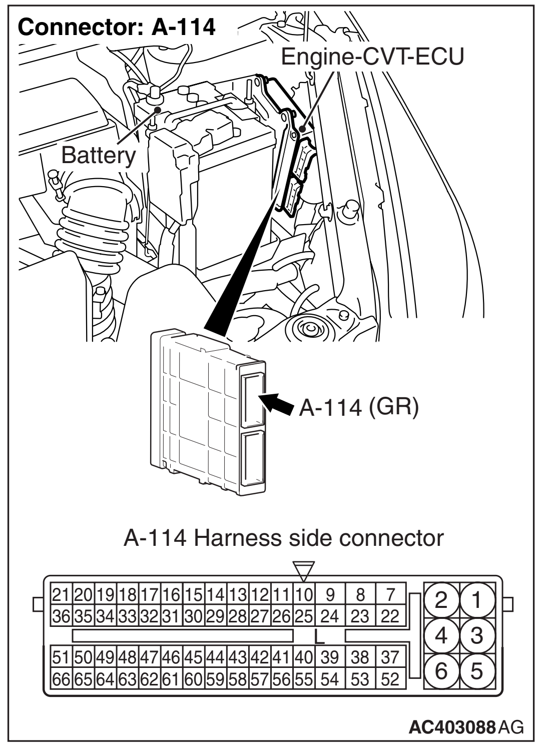
**Q: Is the check result normal?**

**YES :** Go to Step 15.

**NO :** Repair the defective connector.

### STEP 15. Check the harness between turbine speed sensor connector A-120 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.44.




Check the output line for short-circuited.

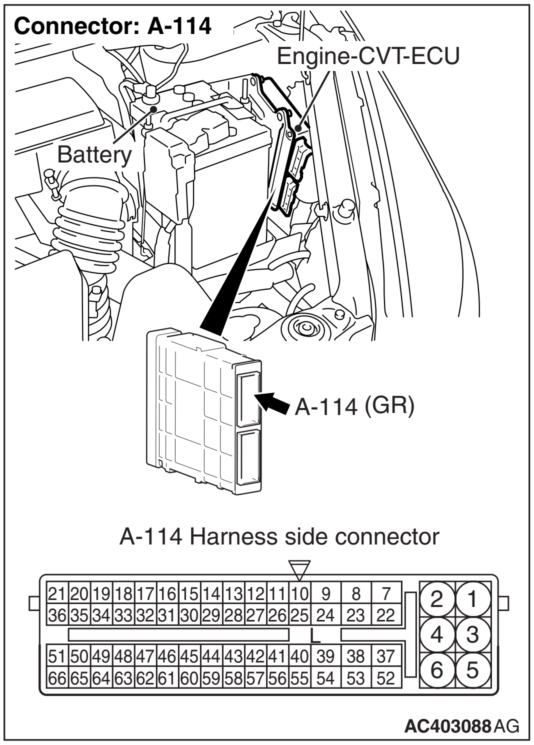
**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

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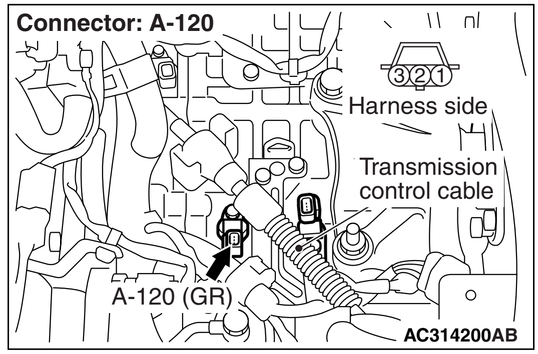
### STEP 16. Connector check: A-114 engine-CVT-ECU connector.

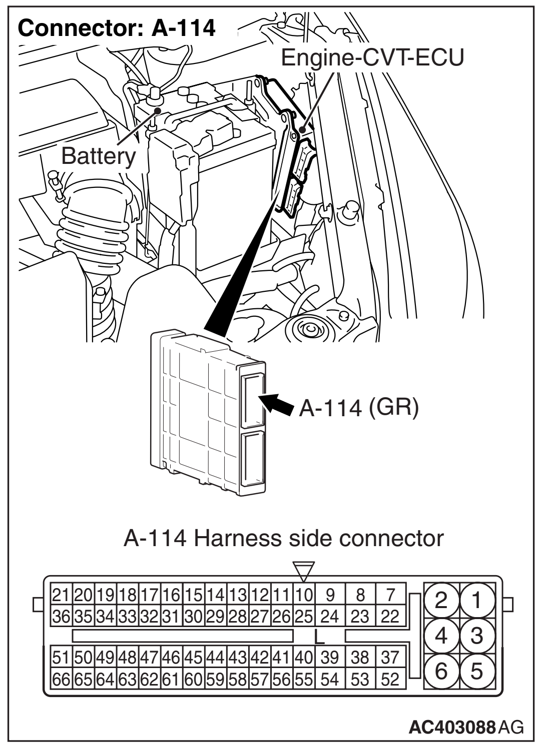



Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 17.
**NO :** Repair the defective connector.

### STEP 17. Check the harness between turbine speed sensor connector A-120 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.44.



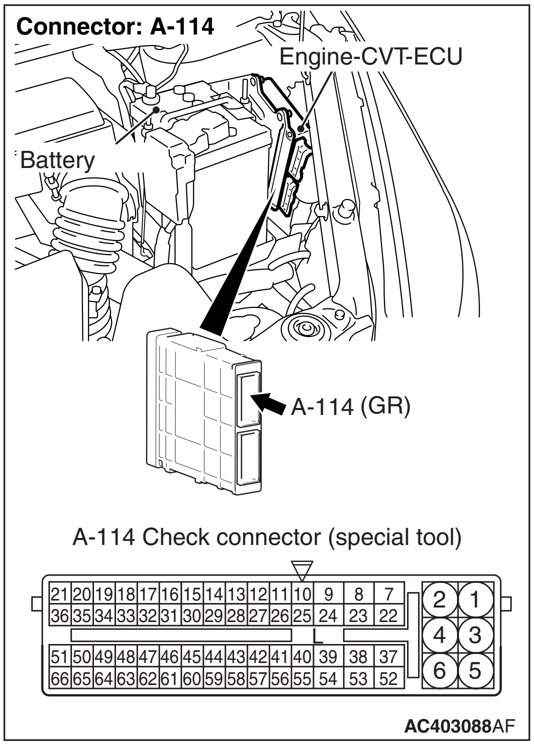




Check the output line for open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Repair the wiring harness.

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**STEP 18. Measure the output wave pattern of the turbine speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).**




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.44 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES : .** Go to Step 6.
**NO : .** Go to Step 19.

**STEP 19. Check the turbine speed sensor and then recheck the diagnosis code.**

(1) Remove the turbine speed sensor. Wipe any metallic particles or dirt off the sensor tip.
(2) Install the turbine speed sensor and road test the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Go to Step 20.
**NO :** The inspection is complete.

**STEP 20. Replace the turbine speed sensor and then recheck the diagnosis code.**

(1) Replace the turbine speed sensor. (Refer to P.23A-155).
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Go to Step 21.
**NO :** The inspection is complete.

**STEP 21. Check the forward clutch retainer.**

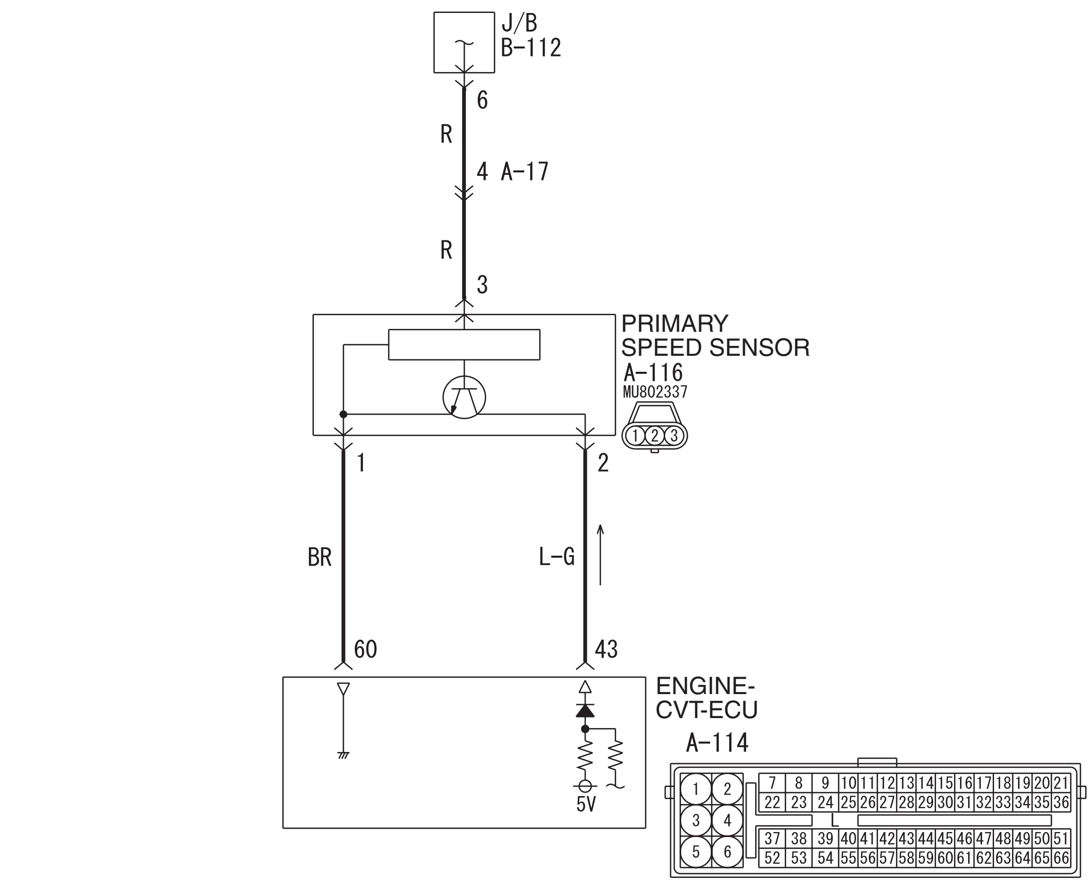
Visually check the forward clutch retainer for damage.

**Q: Is the check result normal?**
**YES :** Eliminate the cause of the noise.
**NO :** Replace the forward clutch retainer (Refer to GROUP 23B, Forward Clutch P.23B-31).

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## Code No.23, 26 Primary Speed Sensor System

Primary Speed Sensor System Circuit




## OPERATION

The primary speed sensor detects the primary pulley speed, and sends the information to the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

- If the primary speed sensor signal is not detected while the vehicle is being driven (secondary speed is 600 r/min), code No.23 will be set.
- If the ECU calculates the transmission ratio as 0.4 or less while the vehicle is being driven (neither primary nor secondary speeds are 0 r/min), code No.26 will be set.

## PROBABLE CAUSES

- Malfunction of primary speed sensor
- Malfunction of secondary speed sensor
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III data list

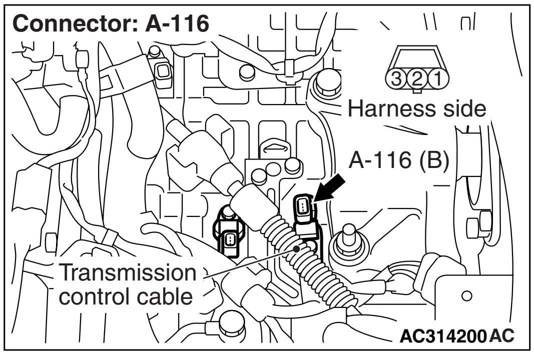
Item 03: Primary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 23.
**NO :** Go to Step 2.

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### STEP 2. Connector check: A-116 primary speed sensor connector.

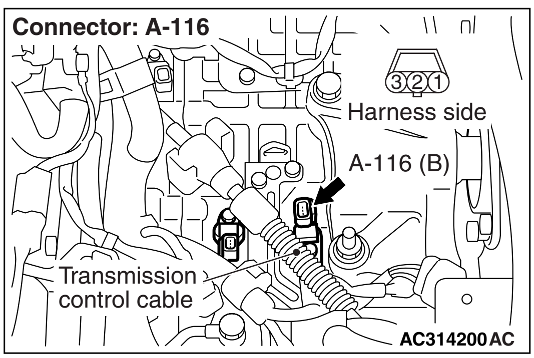



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Repair the defective connector.

### STEP 3. Measure the resistance at primary speed sensor connector A-116.




Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.

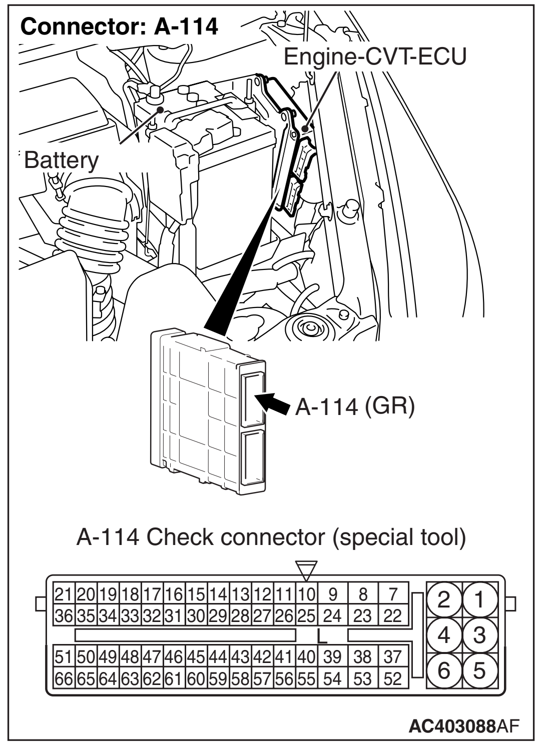
**OK: 2 Ω or less**

**Q: Is the check result normal?**

**YES :** Go to Step 9.
**NO :** Go to Step 4.

### STEP 4. Measure the voltage at engine-CVT-ECU connector A-114.

(1) Connect primary speed sensor connector A-116.



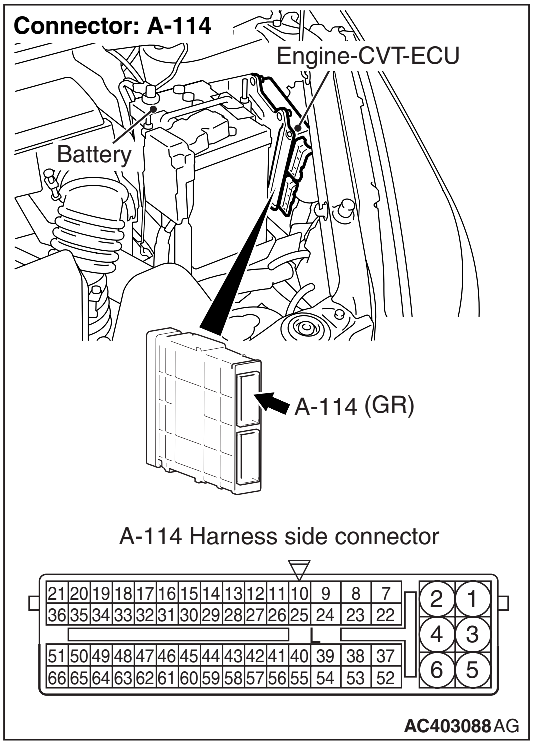

(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.60 and earth.

**OK: 0.5 V or less**

**Q: Is the check result normal?**

**YES :** Go to Step 7.
**NO :** Go to Step 5.

**STEP 5. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the defective connector.

**STEP 6. M.U.T.-III data list**

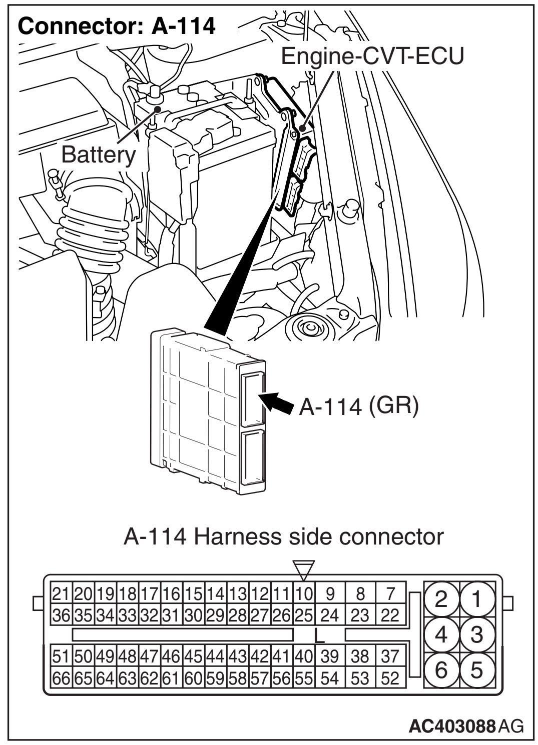
Item 03: Primary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Replace the engine-CVT-ECU.

**STEP 7. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

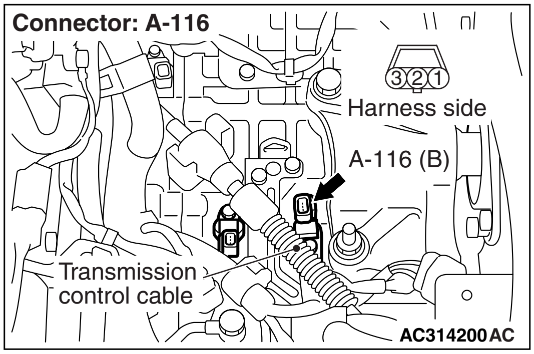
**Q: Is the check result normal?**

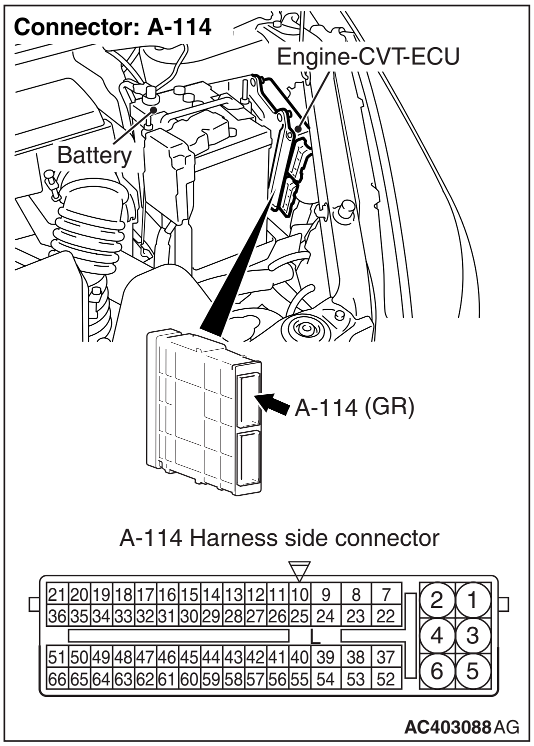
**YES :** Go to Step 8.

**NO :** Repair the defective connector.

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**STEP 8. Check the harness between primary speed sensor connector A-116 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.60.**

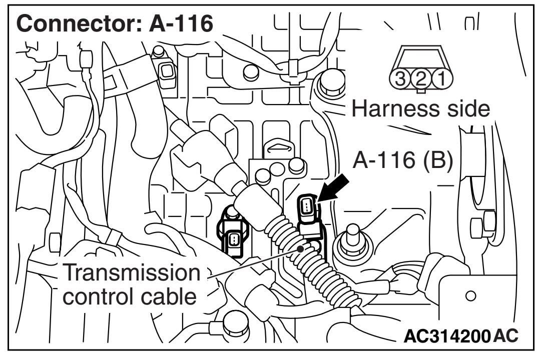



Check the earth line for open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Repair the wiring harness.

**STEP 9. Measure the voltage at primary speed sensor connector A-116.**

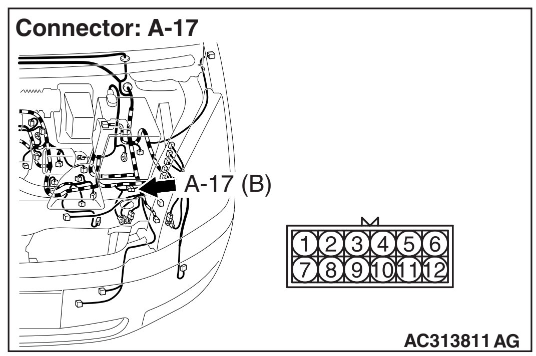


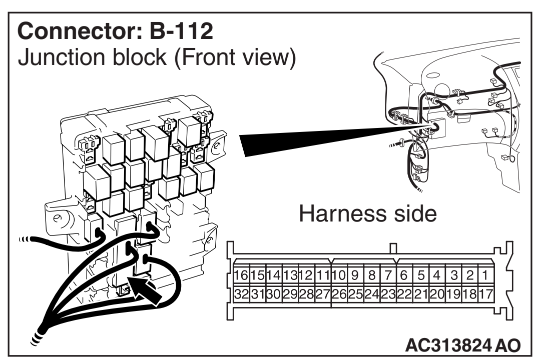

(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: System voltage**

**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Go to Step 10.

**STEP 10. Connectors check: A-17 intermediate connector, B-112 J/B connector.**



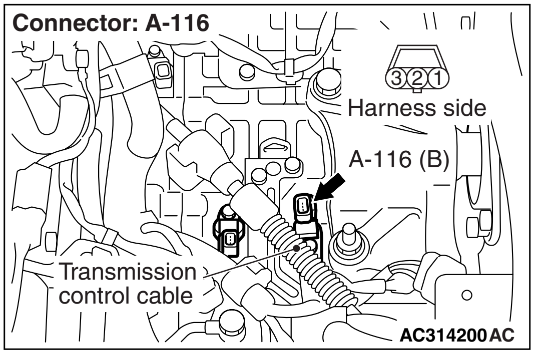



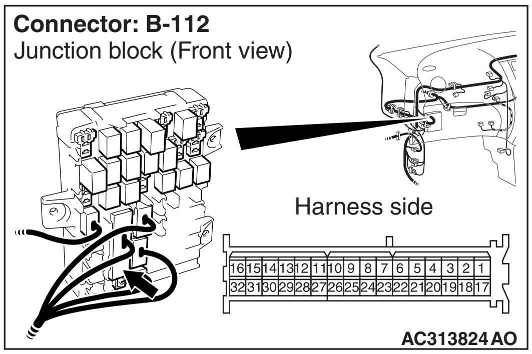

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 11.
**NO :** Repair the defective connector.

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**STEP 11. Check the harness between primary speed sensor connector A-116 terminal No.3 and J/B connector B-112 terminal No.6.**



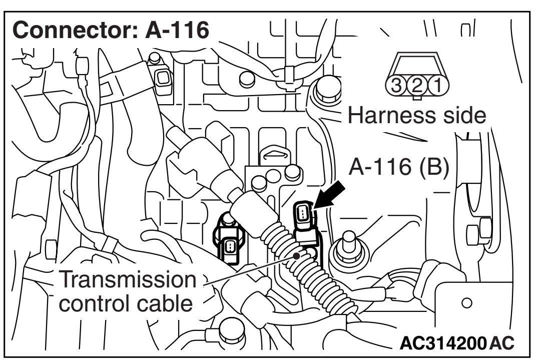

Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

**STEP 12. Measure the voltage at primary speed sensor connector A-116.**




(1) Disconnect the connector, and measure the voltage between terminal 2 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: 4.9 − 5.1 V**

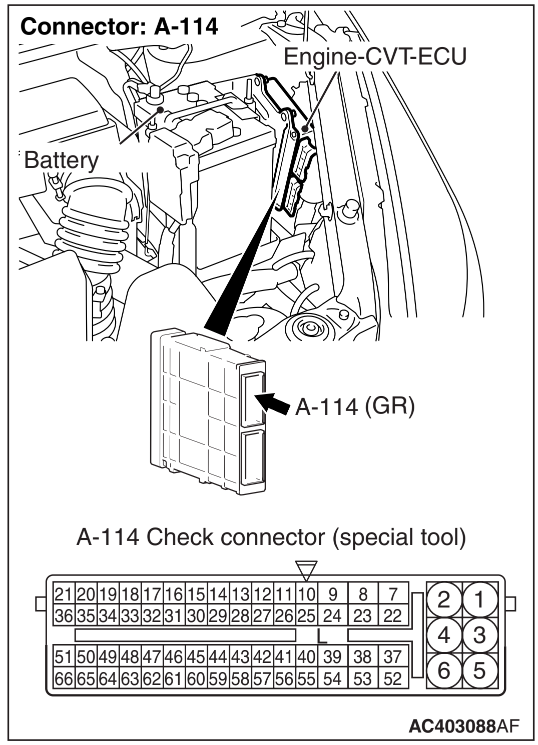
**Q: Is the check result normal?**

**YES : .** Go to Step 18.

**NO : .** Go to Step 13.

**STEP 13. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect primary speed sensor connector A-116.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.43 and earth.

**OK: 4.9 − 5.1 V**

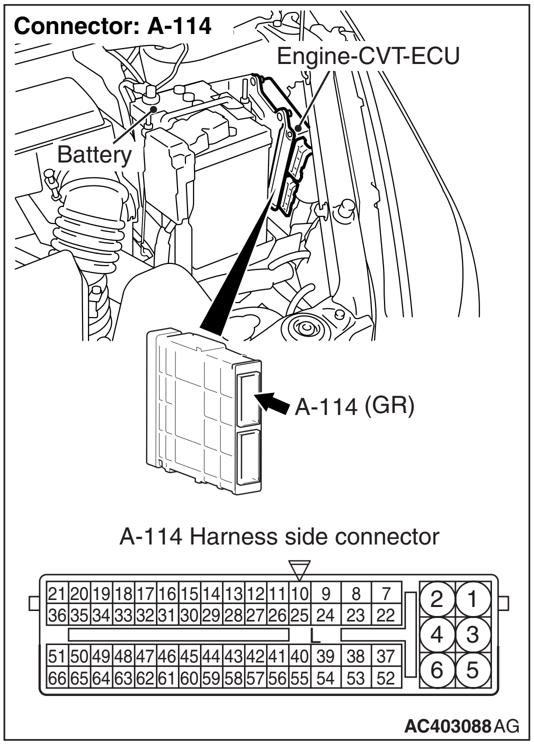
**Q: Is the check result normal?**

**YES :** Go to Step 16.

**NO :** Go to Step 14.

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### STEP 14. Connector check: A-114 engine-CVT-ECU connector.



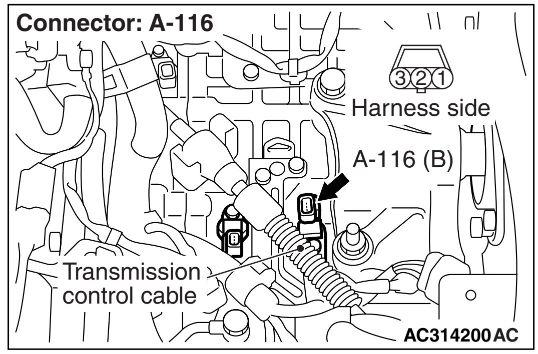

Check for the contact with terminals.

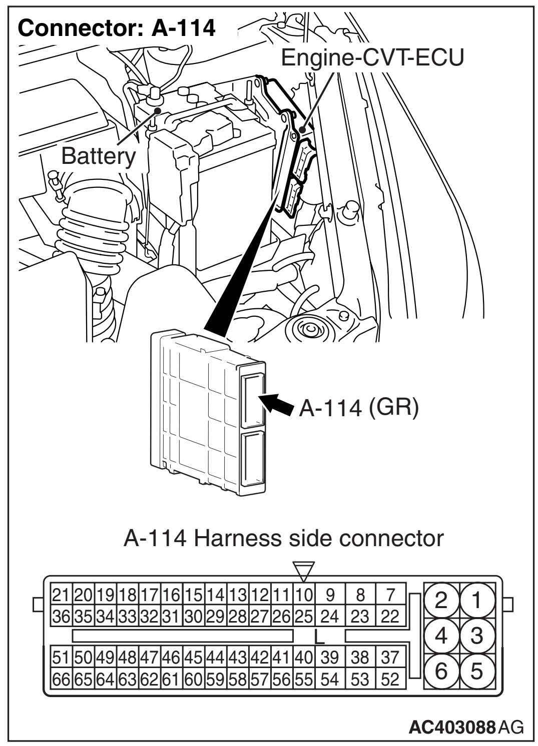
**Q: Is the check result normal?**

**YES :** Go to Step 15.

**NO :** Repair the defective connector.

### STEP 15. Check the harness between primary speed sensor connector A-116 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.43.




Check the output line for short-circuited.

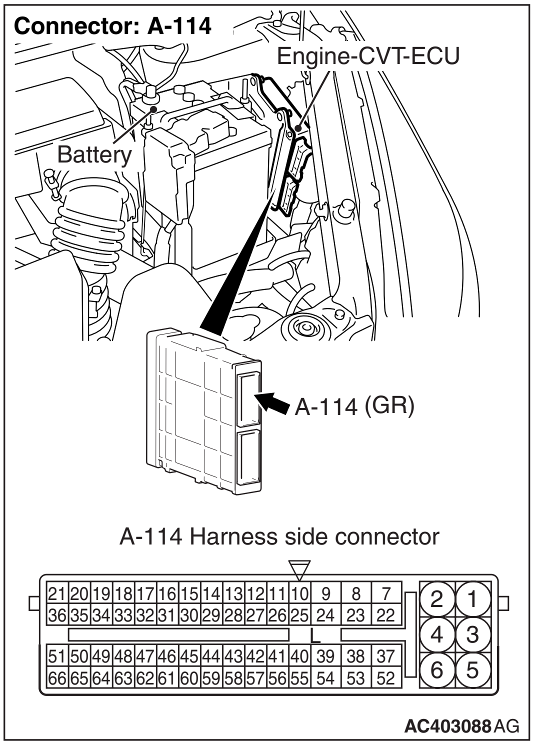
**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

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### STEP 16. Connector check: A-114 engine-CVT-ECU connector.



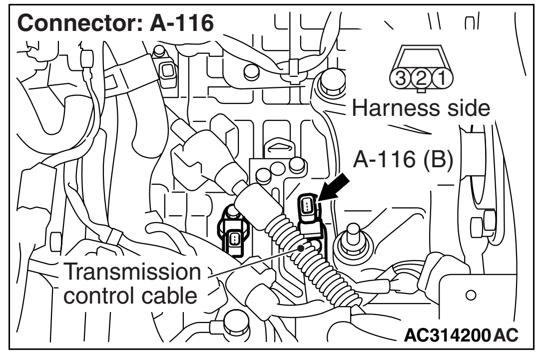

Check for the contact with terminals.

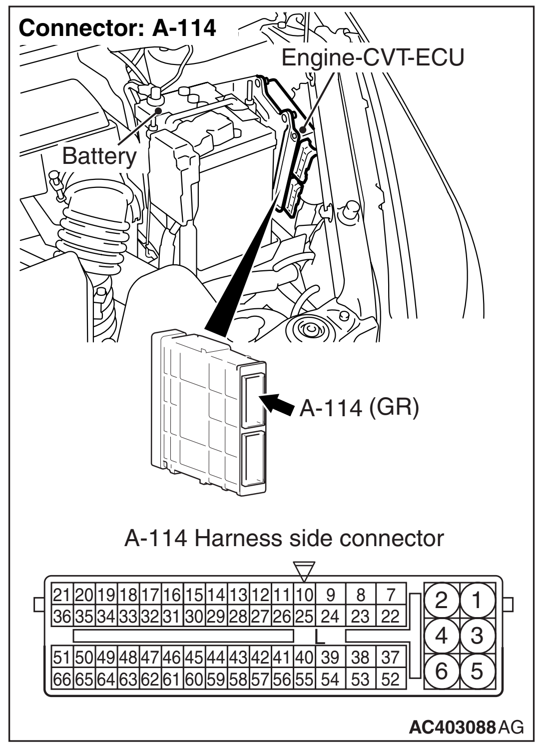
**Q: Is the check result normal?**

**YES :** Go to Step 17.

**NO :** Repair the defective connector.

### STEP 17. Check the harness between primary speed sensor connector A-116 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.43.




Check the output line for open circuit.

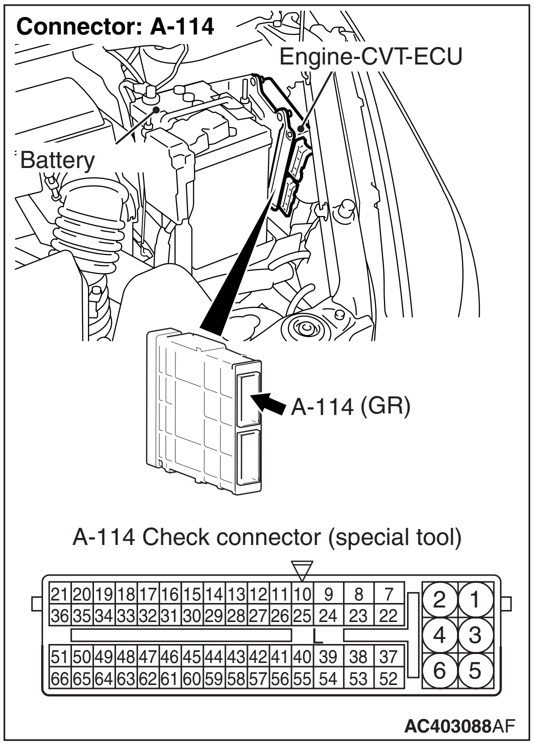
**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

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**STEP 18. Measure the output wave pattern of the primary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).**

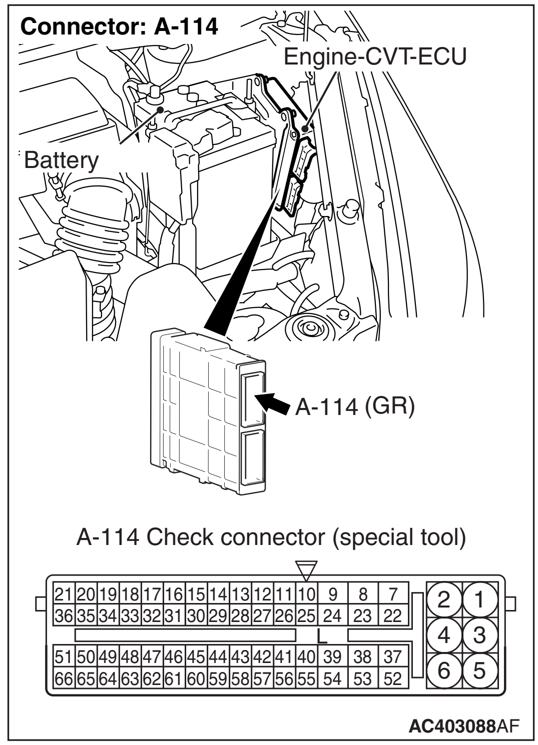



(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.43 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES :** Go to Step 19.
**NO :** Go to Step 20.

**STEP 19. Measure the output wave pattern of the secondary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).**




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.45 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Eliminate the cause of the noise.

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**STEP 20. Check the primary speed sensor and then recheck the diagnosis code.**

(1) Remove the primary speed sensor. Wipe any metallic particles or dirt off the sensor tip.
(2) Install the primary speed sensor and road test the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**

**YES :** Go to Step 21.
**NO :** The inspection is complete.

**STEP 21. Replace the primary speed sensor and then recheck the diagnosis code.**

(1) Replace the primary speed sensor. (Refer to P.23A-155).
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**

**YES :** Go to Step 22.
**NO :** The inspection is complete.

**STEP 22. Replace the CVT assembly and then recheck the diagnosis code.**

(1) Replace the CVT assembly.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**

**YES :** Eliminate the cause of the noise.
**NO :** The inspection is complete.

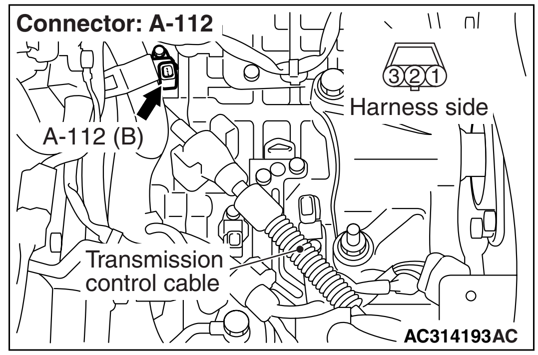
**STEP 23. M.U.T.-III data list**

Item 04: Secondary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Go to Step 24.

**STEP 24. Connector check: A-112 secondary speed sensor connector.**

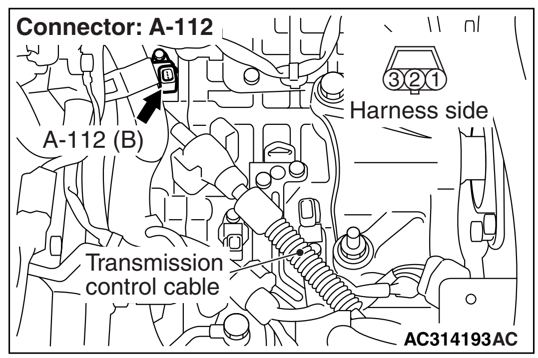



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 25.
**NO :** Repair the defective connector.

**STEP 25. Measure the resistance at secondary speed sensor connector A-112.**




Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.

**OK: 2 Ω or less**

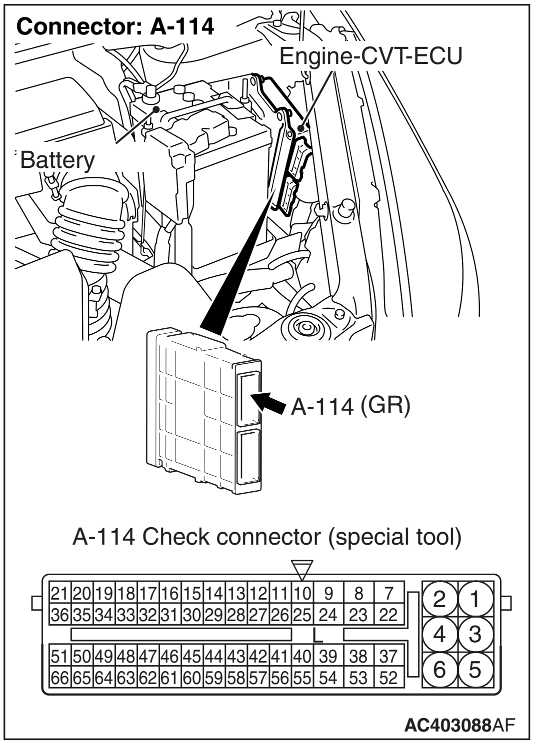
**Q: Is the check result normal?**

**YES :** Go to Step 31.
**NO :** Go to Step 26.

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**STEP 26. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect secondary speed sensor connector A-112.

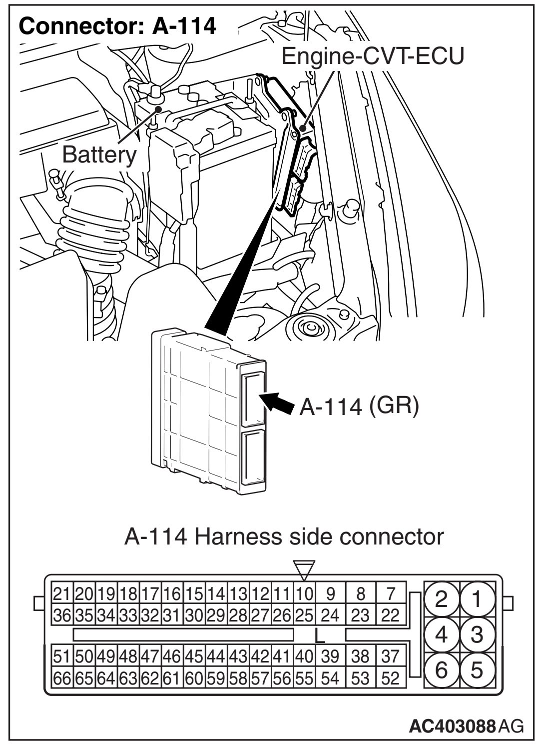



(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.60 and earth.

**OK: 0.5 V or less**

**Q: Is the check result normal?**
**YES :** Go to Step 29.
**NO :** Go to Step 27.

**STEP 27. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 28.
**NO :** Repair the defective connector.

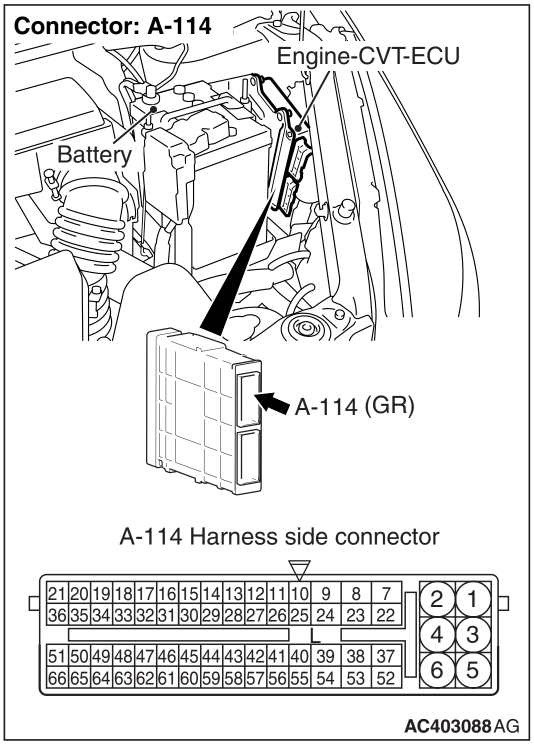
**STEP 28. M.U.T.-III data list**

Item 04: Secondary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**
**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

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### STEP 29. Connector check: A-114 engine-CVT-ECU connector.

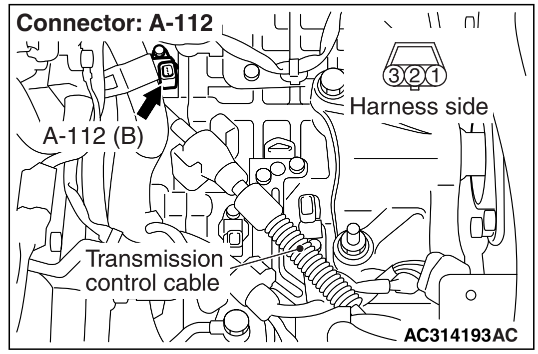


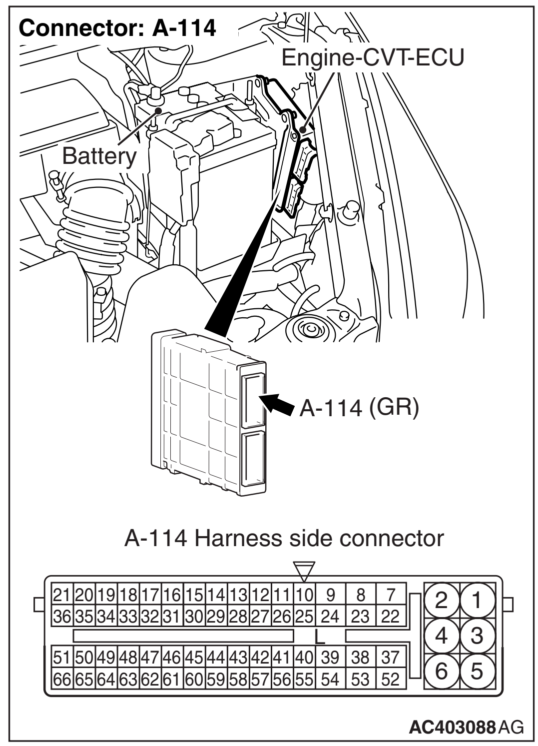

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 30.
**NO :** Repair the defective connector.

### STEP 30. Check the harness between secondary speed sensor connector A-112 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.60.



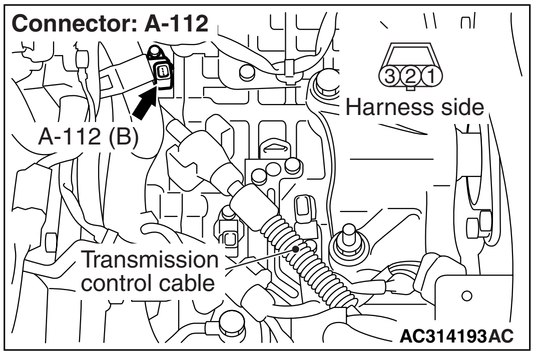




Check the earth line for open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 28.
**NO :** Repair the wiring harness.

### STEP 31. Measure the voltage at secondary speed sensor connector A-112.

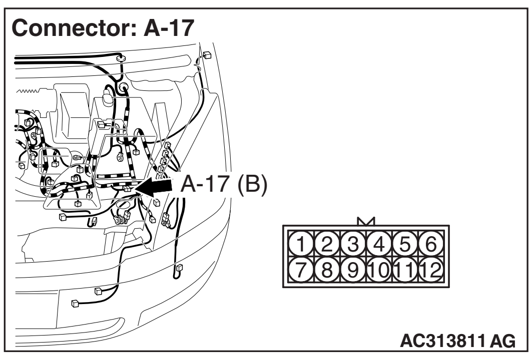


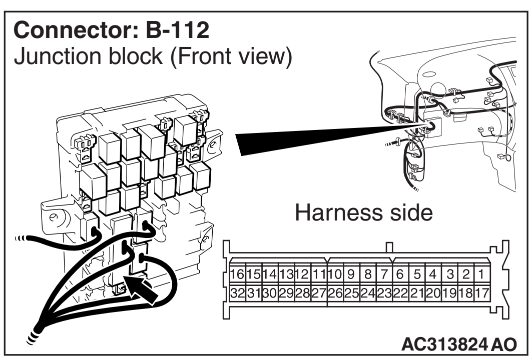

(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: System voltage**

**Q: Is the check result normal?**
**YES :** Go to Step 34.
**NO :** Go to Step 32.

### STEP 32. Connectors check: A-17 intermediate connector, B-112 J/B connector.

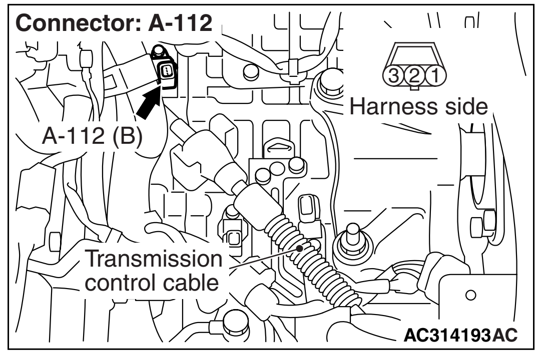


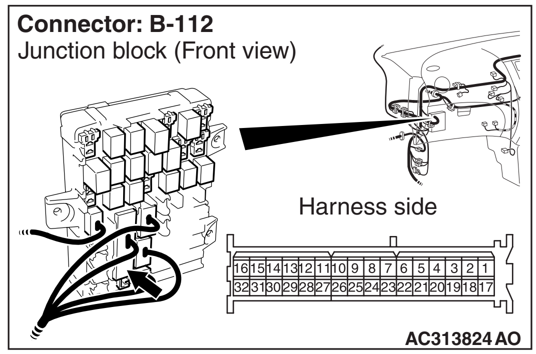




Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 33.
**NO :** Repair the defective connector.

### STEP 33. Check the harness between secondary speed sensor connector A-112 terminal No.3 and J/B connector B-112 terminal No.6.

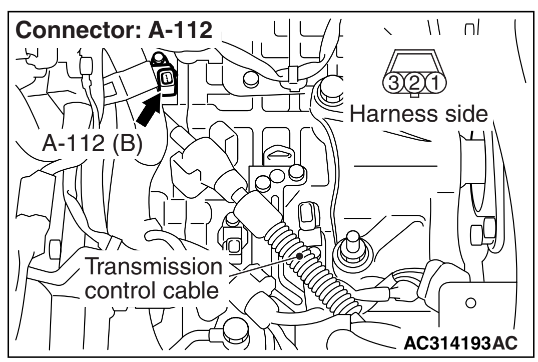



Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 28.
**NO :** Repair the wiring harness.

### STEP 34. Measure the voltage at secondary speed sensor connector A-112.




(1) Disconnect the connector, and measure the voltage between terminal 2 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

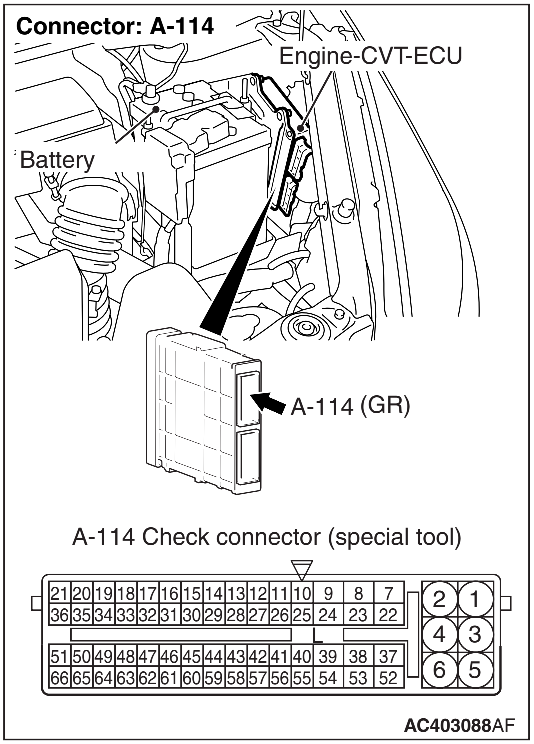
**OK: 4.9 – 5.1 V**

**Q: Is the check result normal?**
**YES :** Go to Step 40.
**NO :** Go to Step 35.

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**STEP 35. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect secondary speed sensor connector A-112.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.45 and earth.

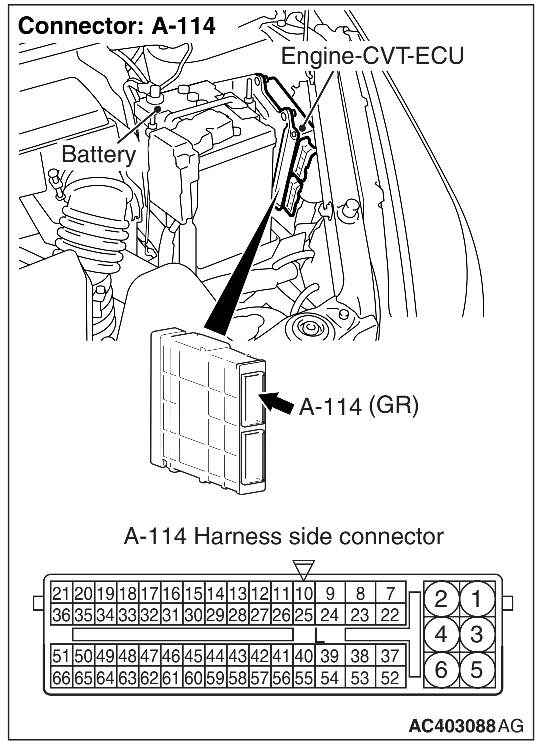
**OK: 4.9 – 5.1 V**

**Q: Is the check result normal?**

**YES : .** Go to Step 38.

**NO : .** Go to Step 36.

**STEP 36. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

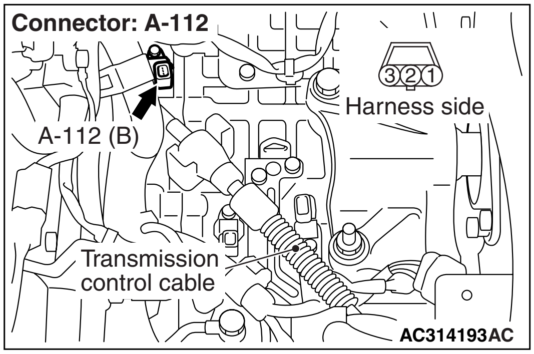
**Q: Is the check result normal?**

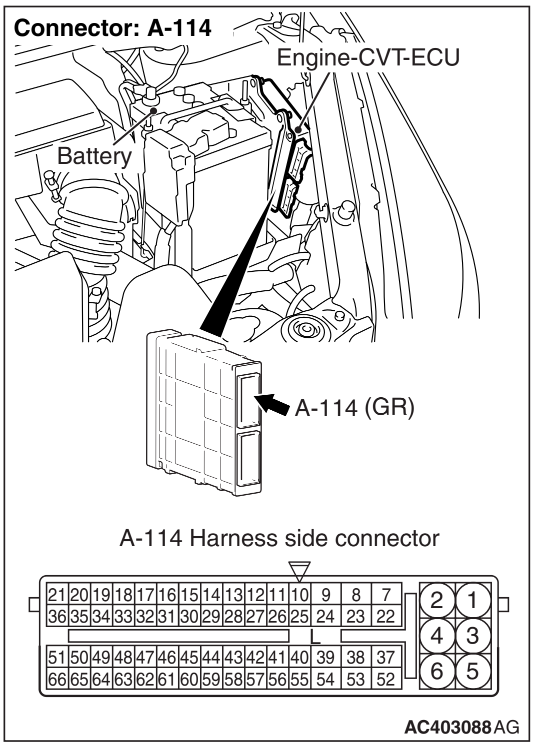
**YES :** Go to Step 37.

**NO :** Repair the defective connector.

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**STEP 37. Check the harness between secondary speed sensor connector A-112 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.45.**

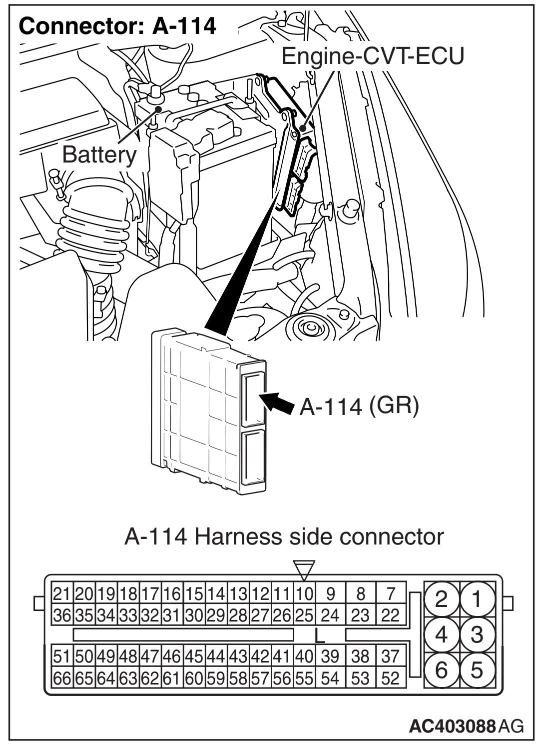



Check the output line for short-circuited.

**Q: Is the check result normal?**
**YES :** Go to Step 28.
**NO :** Repair the wiring harness.

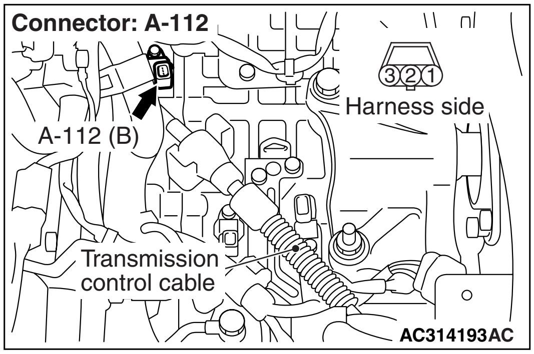
**STEP 38. Connector check: A-114 engine-CVT-ECU connector.**

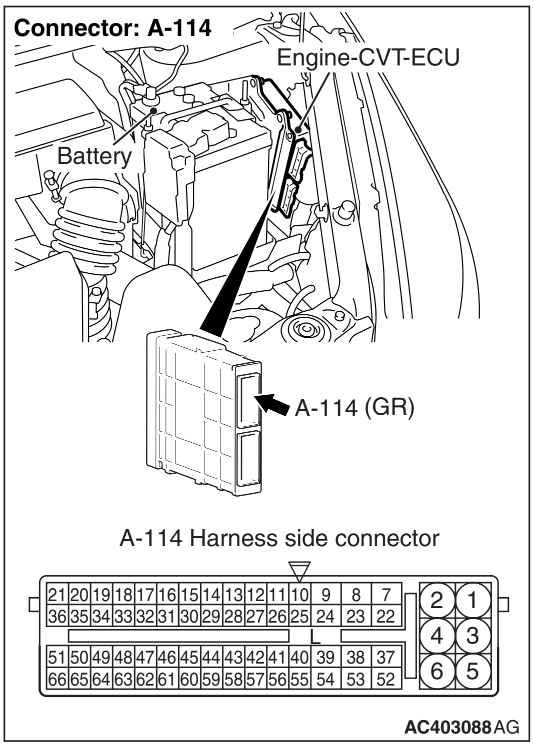



Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 39.
**NO :** Repair the defective connector.

### STEP 39. Check the harness between secondary speed sensor connector A-112 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.45.



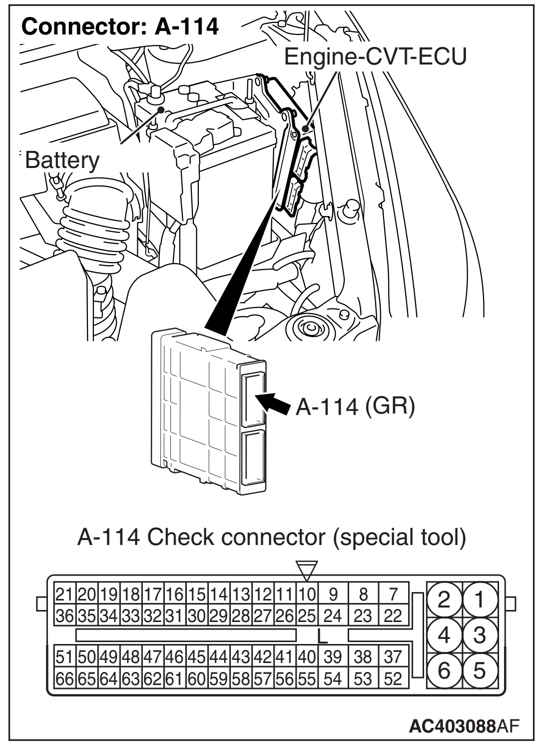

Check the output line for open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 28.

**NO :** Repair the wiring harness.

### STEP 40. Measure the output wave pattern of the secondary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.45 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

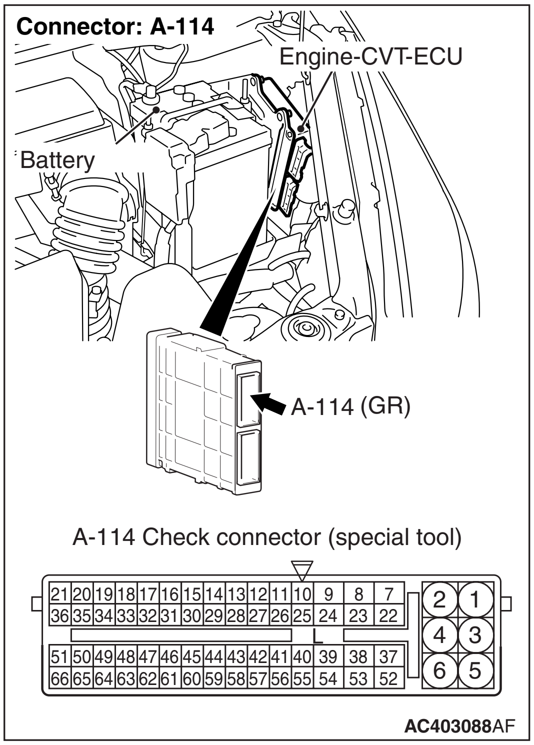
**Q: Is the check result normal?**

**YES :** Go to Step 41.

**NO :** Go to Step 42.

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**STEP 41. Measure the output wave pattern of the primary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).**




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.43 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES : .** Go to Step 28.
**NO : .** Eliminate the cause of the noise.

**STEP 42. Check the secondary speed sensor and then recheck the diagnosis code.**

(1) Remove the secondary speed sensor. Wipe any metallic particles or dirt off the sensor tip.
(2) Install the secondary speed sensor and road test the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Go to Step 43.
**NO :** The inspection is complete.

**STEP 43. Replace the secondary speed sensor and then recheck the diagnosis code.**

(1) Replace the secondary speed sensor. (Refer to P.23A-155).
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Go to Step 44.
**NO :** The inspection is complete.

**STEP 44. Replace the CVT assembly and then recheck the diagnosis code.**

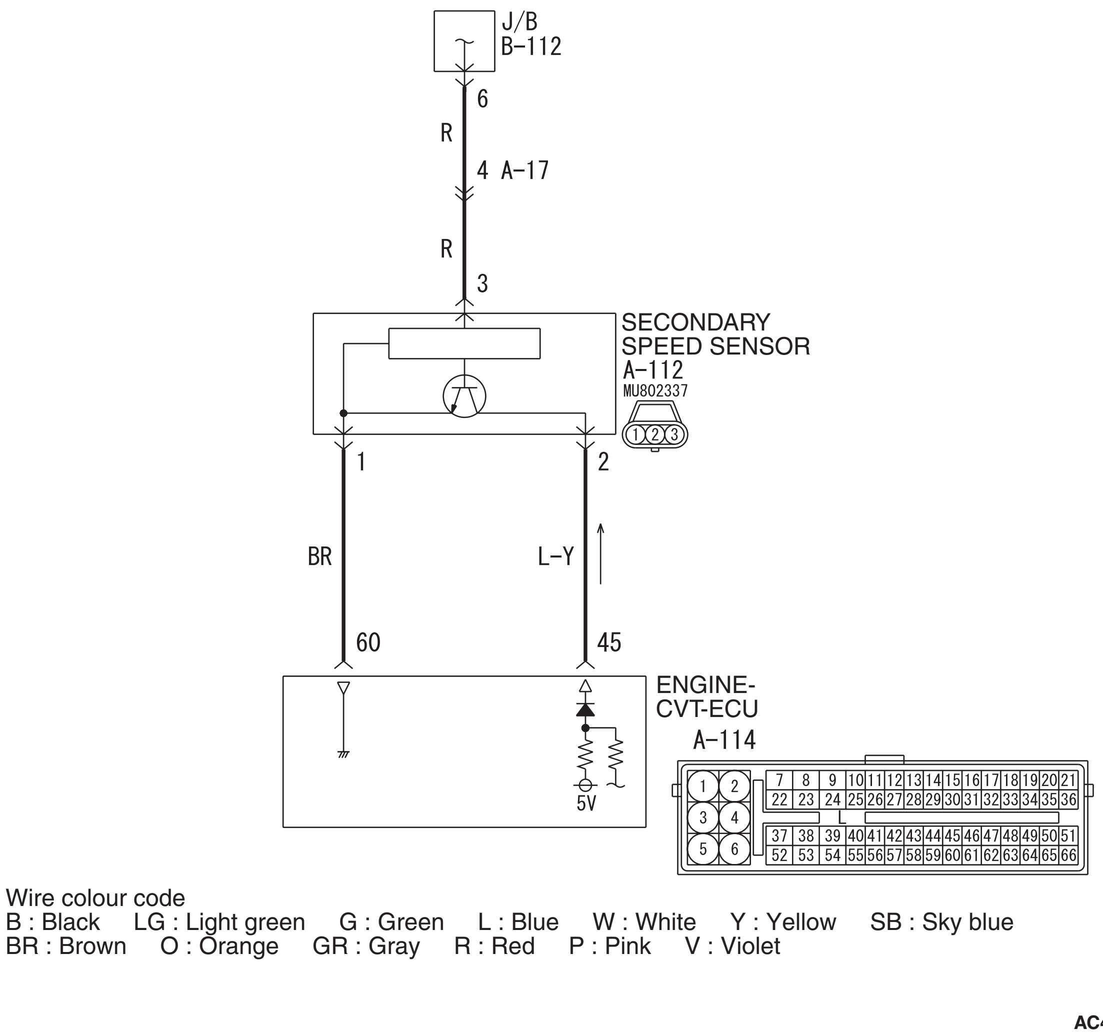
(1) Replace the CVT assembly.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Eliminate the cause of the noise.
**NO :** The inspection is complete.

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## Code No.24, 25 Secondary Speed Sensor System

**Secondary Speed Sensor System Circuit**




## OPERATION

The secondary speed sensor detects the secondary pulley speed at the transfer drive gear, and sends the information to the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

- If the secondary speed sensor signal is not detected while the vehicle is being driven (primary speed is 1,000 r/min), code No.24 will be set.
- If the ECU calculates the transmission ratio as 2.5 or more and this condition lasts for 30 seconds while the vehicle is being driven (neither primary nor secondary speeds are 0 r/min), code No.25 will be set.

## PROBABLE CAUSES

- Malfunction of secondary speed sensor
- Malfunction of primary speed sensor
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU
- Malfunction of line pressure control solenoid valve
- Faulty CVT power train system

## DIAGNOSIS PROCEDURE

### STEP 1. Road test

**Q: Can the vehicle be driven at the D range?**

**YES :** Go to Step 2.

**NO :** Replace the CVT assembly.

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### STEP 2. M.U.T.-III diagnosis code

**Q: Is diagnosis code 31 set?**

**YES :** Refer to diagnosis code 31: Line pressure control solenoid valve system P.23A-77.

**NO :** Go to Step 3.

### STEP 3. M.U.T.-III data list

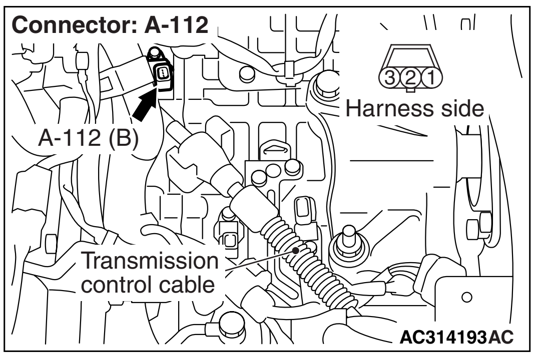
Item 04: Secondary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 25.

**NO :** Go to Step 4.

### STEP 4. Connector check: A-112 secondary speed sensor connector.



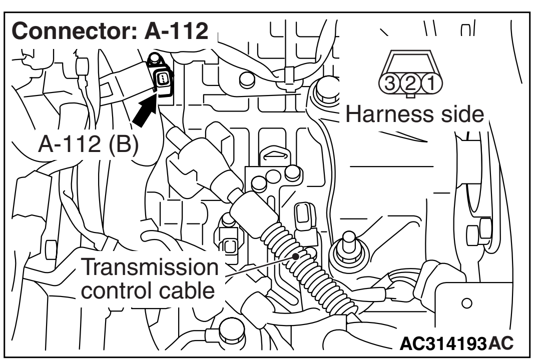

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 5.

**NO :** Repair the defective connector.

### STEP 5. Measure the resistance at secondary speed sensor connector A-112.




Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.

**OK: 2 Ω or less**

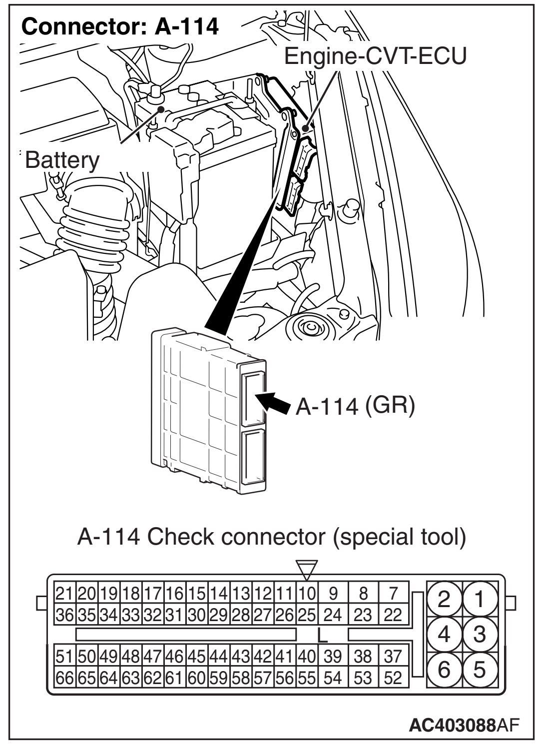
**Q: Is the check result normal?**

**YES :** Go to Step 11.

**NO :** Go to Step 6.

### STEP 6. Measure the voltage at engine-CVT-ECU connector A-114.

(1) Connect secondary speed sensor connector A-112.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.60 and earth.

**OK: 0.5 V or less**

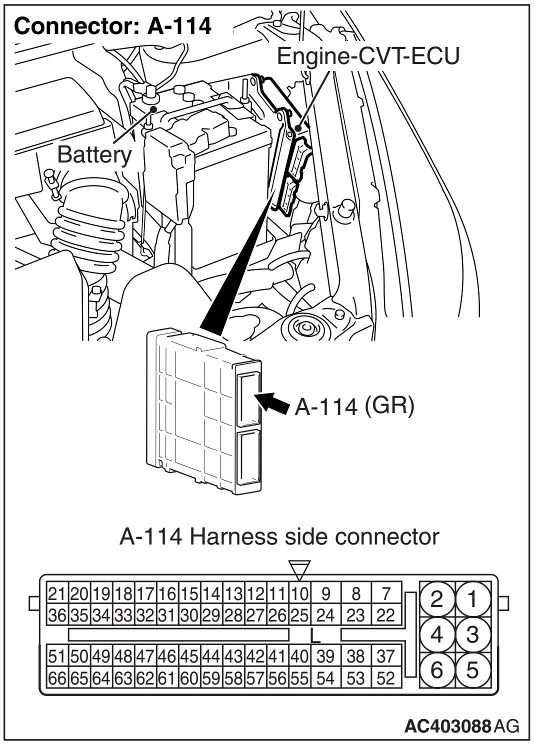
**Q: Is the check result normal?**

**YES :** Go to Step 9.

**NO :** Go to Step 7.

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### STEP 7. Connector check: A-114 engine-CVT-ECU connector.




Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Repair the defective connector.

### STEP 8. M.U.T.-III data list

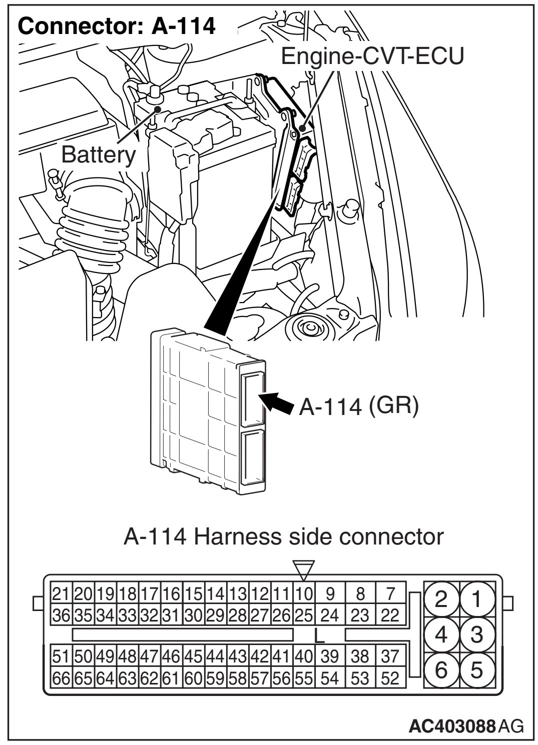
Item 04: Secondary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Replace the engine-CVT-ECU.

### STEP 9. Connector check: A-114 engine-CVT-ECU connector.



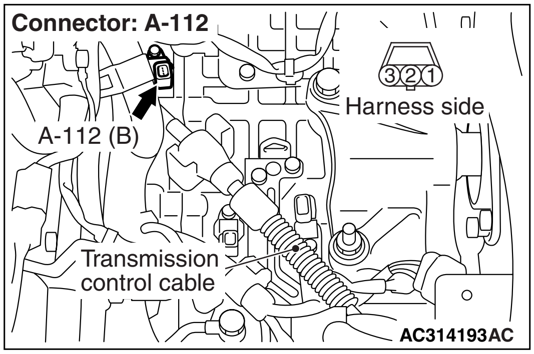

Check for the contact with terminals.

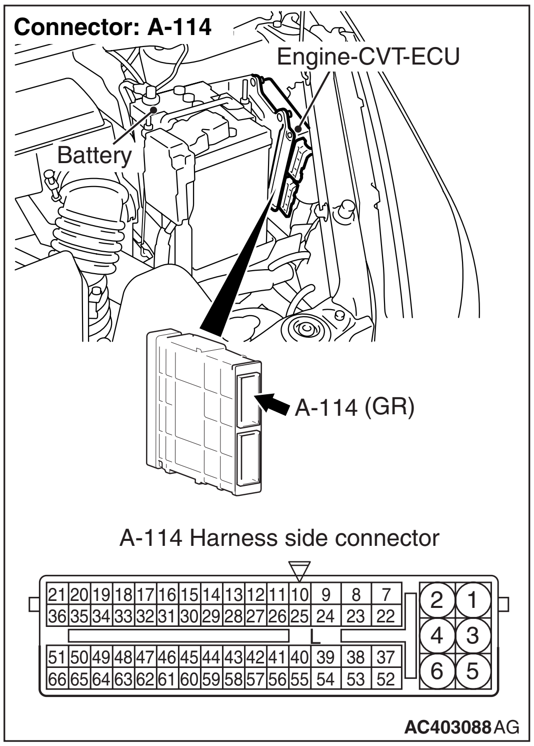
**Q: Is the check result normal?**

**YES :** Go to Step 10.

**NO :** Repair the defective connector.

### STEP 10. Check the harness between secondary speed sensor connector A-112 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.60.

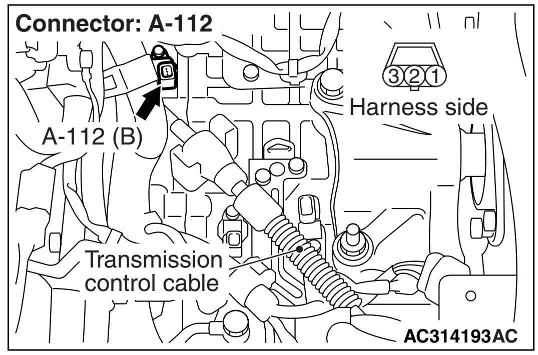



Check the earth line for open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

### STEP 11. Measure the voltage at secondary speed sensor connector A-112.

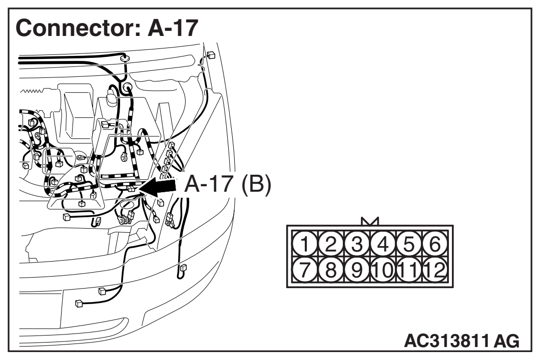


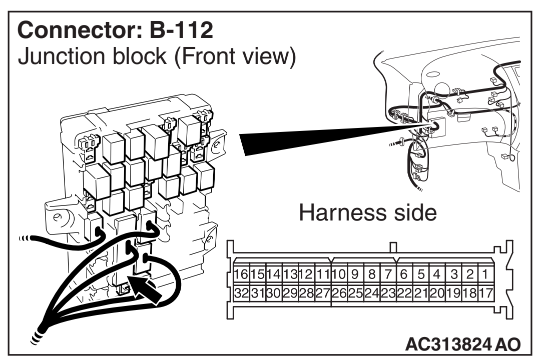

(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: System voltage**

**Q: Is the check result normal?**
**YES :** Go to Step 14.
**NO :** Go to Step 12.

### STEP 12. Connectors check: A-17 intermediate connector, B-112 J/B connector.



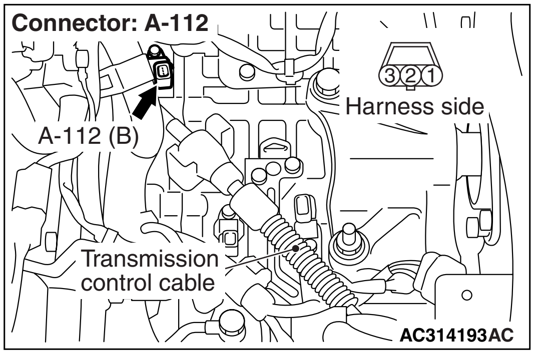



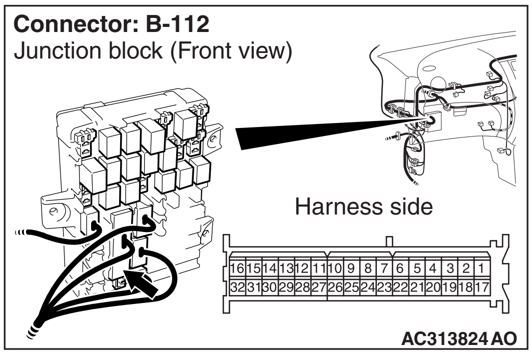

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 13.
**NO :** Repair the defective connector.

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**STEP 13. Check the harness between secondary speed sensor connector A-112 terminal No.3 and J/B connector B-112 terminal No.6.**



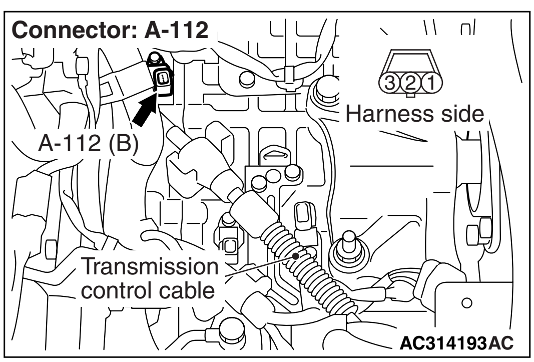

Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Repair the wiring harness.

**STEP 14. Measure the voltage at secondary speed sensor connector A-112.**




(1) Disconnect the connector, and measure the voltage between terminal 2 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: 4.9 – 5.1 V**

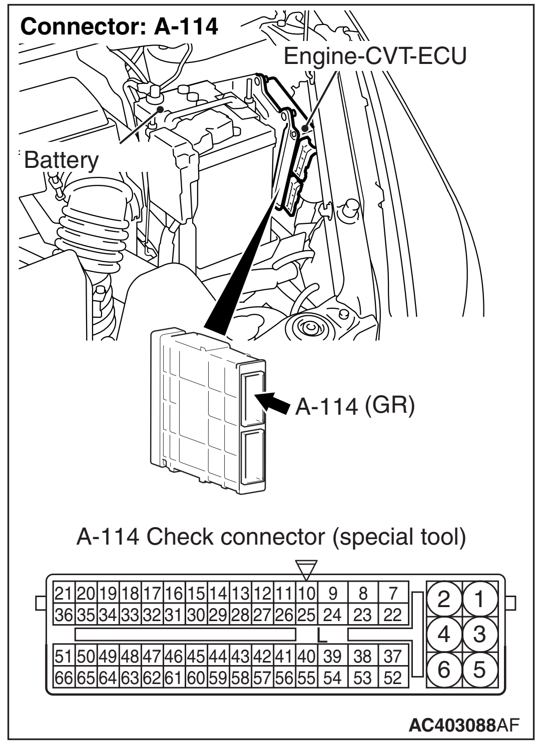
**Q: Is the check result normal?**

**YES : .** Go to Step 20.

**NO :** Go to Step 15.

**STEP 15. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect secondary speed sensor connector A-112.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.45 and earth.

**OK: 4.9 – 5.1 V**

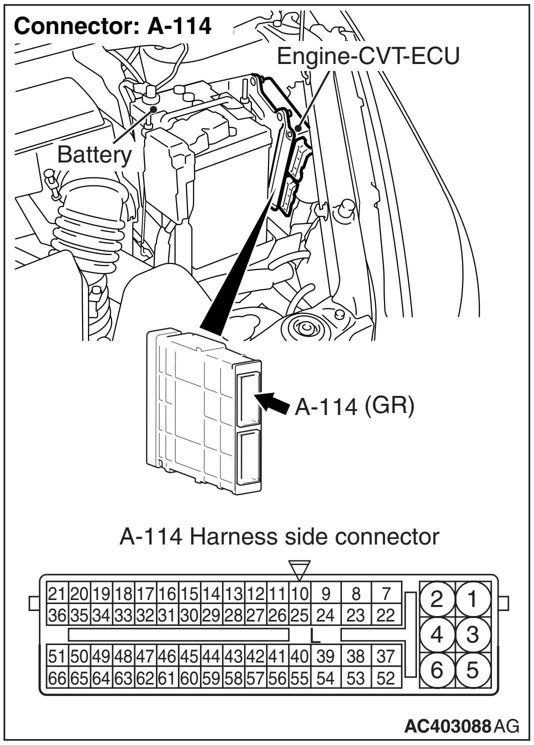
**Q: Is the check result normal?**

**YES :** Go to Step 18.

**NO :** Go to Step 16.

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### STEP 16. Connector check: A-114 engine-CVT-ECU connector.



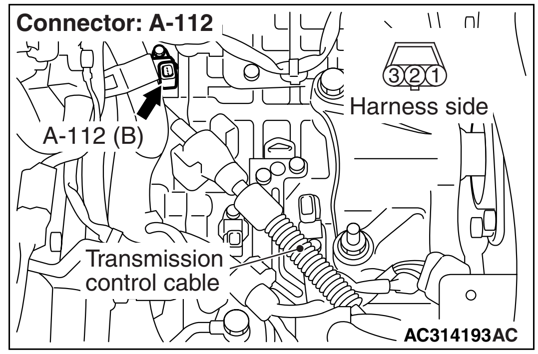

Check for the contact with terminals.

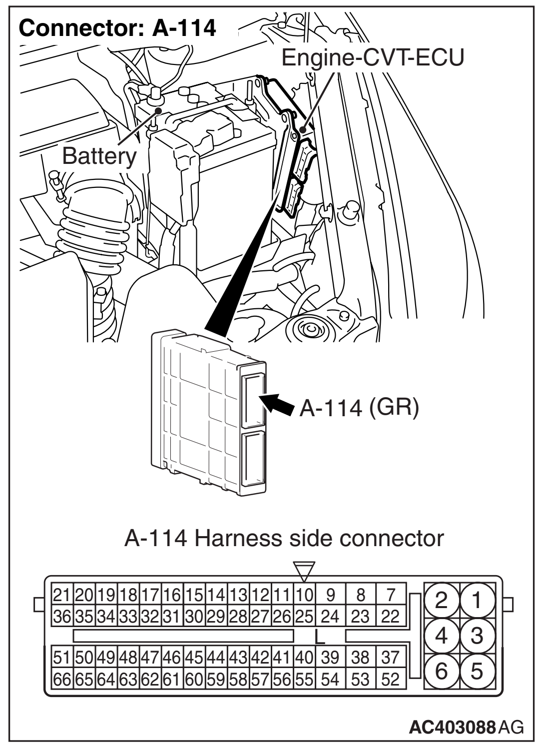
**Q: Is the check result normal?**

**YES :** Go to Step 17.

**NO :** Repair the defective connector.

### STEP 17. Check the harness between secondary speed sensor connector A-112 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.45.




Check the output line for short-circuited.

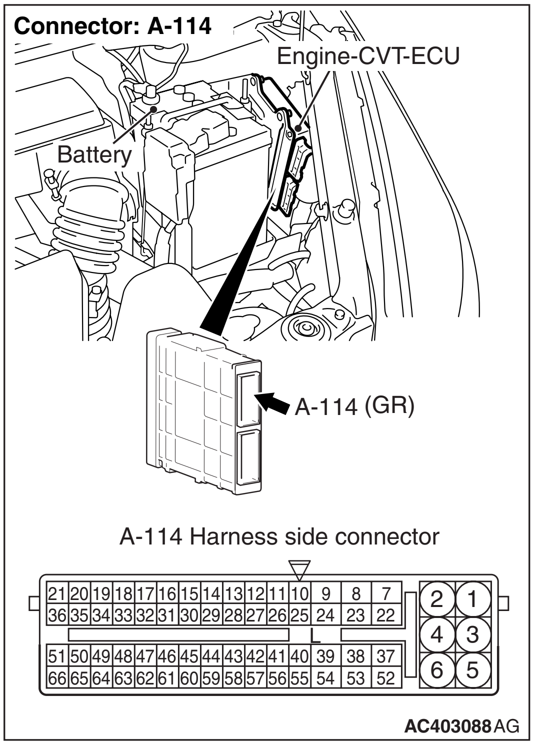
**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Repair the wiring harness.

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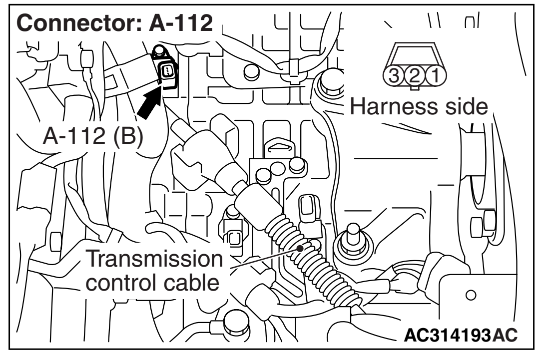
### STEP 18. Connector check: A-114 engine-CVT-ECU connector.

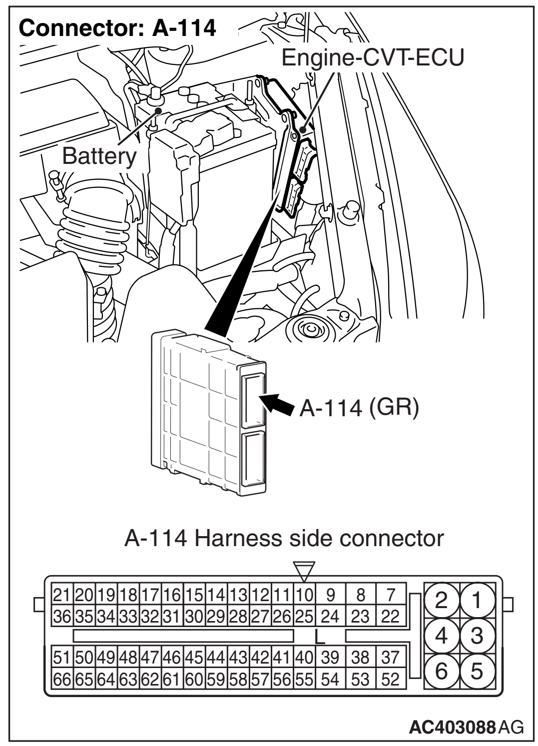



Check for the contact with terminals.

**Q: Is the check result normal?**
- **YES :** Go to Step 19.
- **NO :** Repair the defective connector.

### STEP 19. Check the harness between secondary speed sensor connector A-112 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.45.



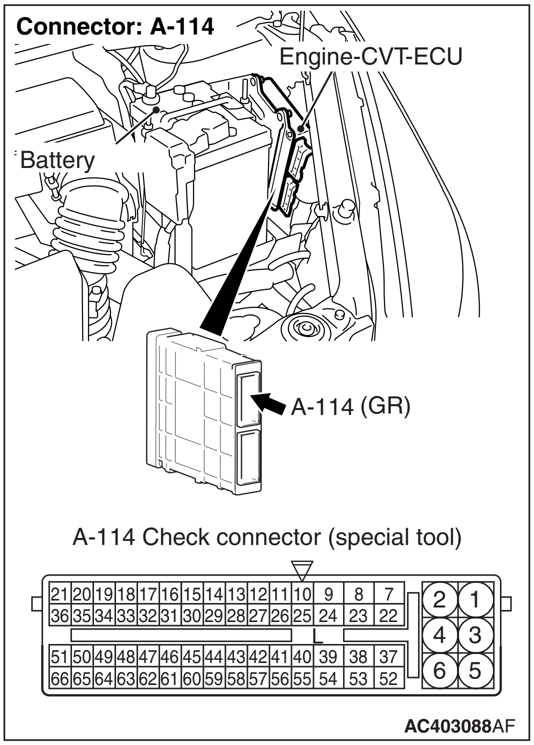




Check the output line for open circuit.

**Q: Is the check result normal?**
- **YES :** Go to Step 8.
- **NO :** Repair the wiring harness.

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### STEP 20. Measure the output wave pattern of the secondary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).

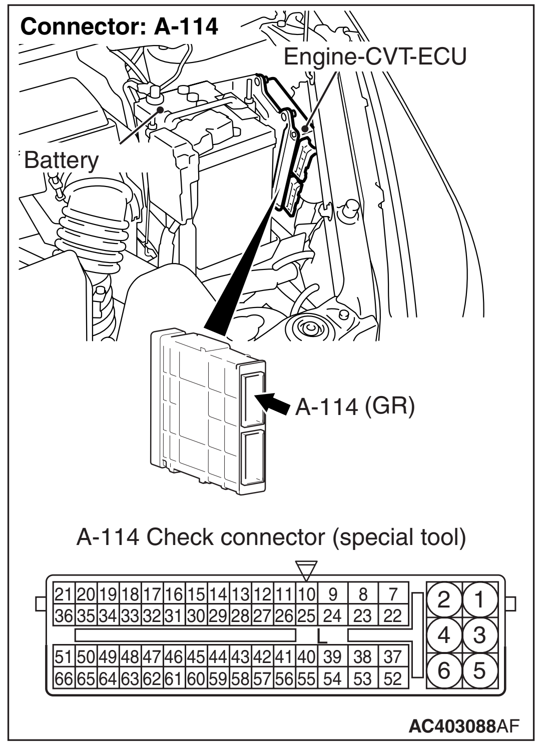



(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.45 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES :** Go to Step 21.
**NO :** Go to Step 22.

### STEP 21. Measure the output wave pattern of the primary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.43 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES :** Go to Step 8.
**NO :** Eliminate the cause of the noise.

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**STEP 22. Check the secondary speed sensor and then recheck the diagnosis code.**

(1) Remove the secondary speed sensor. Wipe any metallic particles or dirt off the sensor tip.
(2) Install the secondary speed sensor and road test the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**

**YES :** Go to Step 23.
**NO :** The inspection is complete.

**STEP 23. Replace the secondary speed sensor and then recheck the diagnosis code.**

(1) Replace the secondary speed sensor. (Refer to P.23A-155).
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**

**YES :** Go to Step 24.
**NO :** The inspection is complete.

**STEP 24. Replace the CVT assembly and then recheck the diagnosis code.**

(1) Replace the CVT assembly.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**

**YES :** Eliminate the cause of the noise.
**NO :** The inspection is complete.

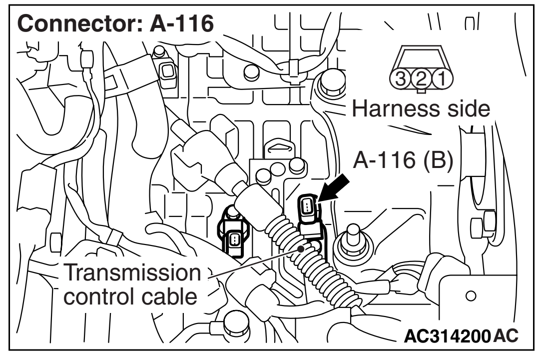
**STEP 25. M.U.T.-III data list**

Item 03: Primary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Go to Step 26.

**STEP 26. Connector check: A-116 primary speed sensor connector.**

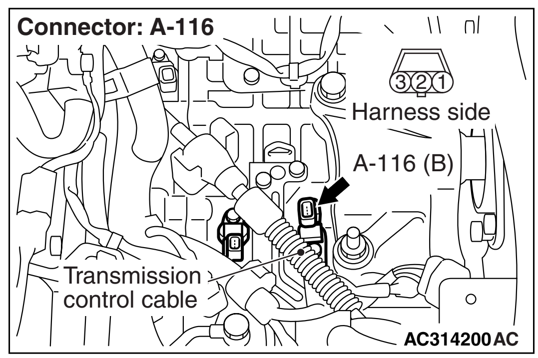



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 27.
**NO :** Repair the defective connector.

**STEP 27. Measure the resistance at primary speed sensor connector A-116.**




Disconnect the connector, and measure the resistance between terminal 1 and earth at the wiring harness side.

**OK: 2 Ω or less**

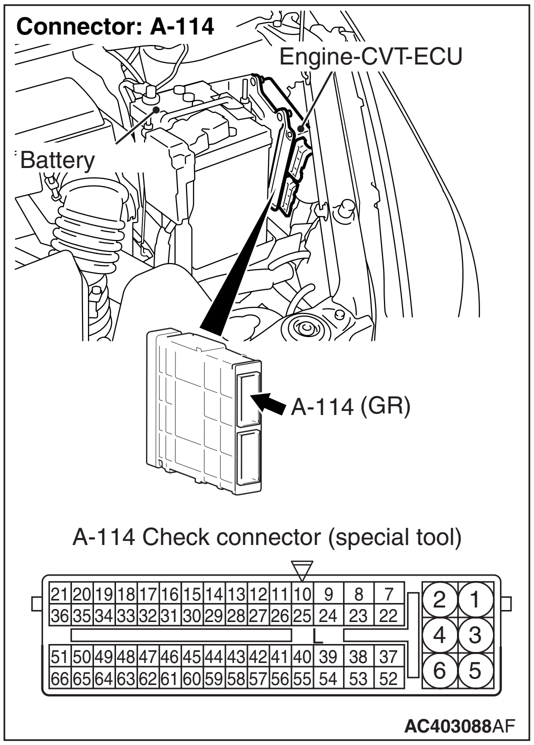
**Q: Is the check result normal?**

**YES :** Go to Step 33.
**NO :** Go to Step 28.

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**STEP 28. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect primary speed sensor connector A-116.



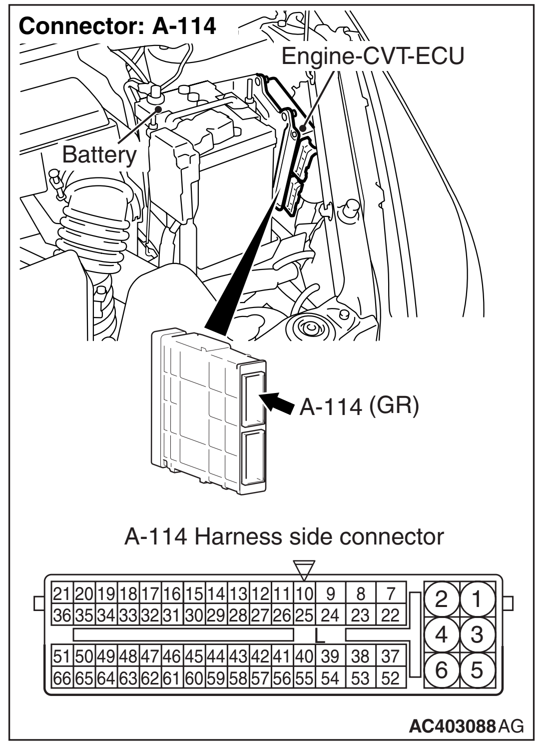

(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.60 and earth.

**OK: 0.5 V or less**

**Q: Is the check result normal?**

**YES :** Go to Step 31.
**NO :** Go to Step 29.

**STEP 29. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 30.
**NO :** Repair the defective connector.

**STEP 30. M.U.T.-III data list**

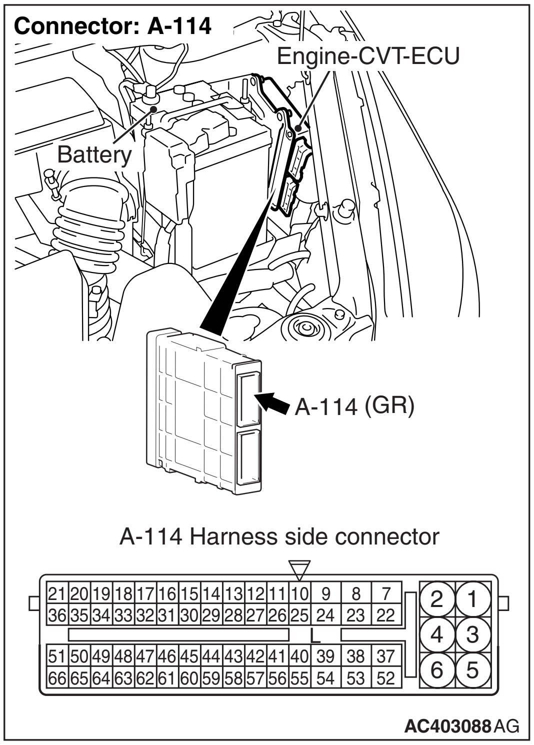
Item 03: Primary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

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**STEP 31. Connector check: A-114 engine-CVT-ECU connector.**



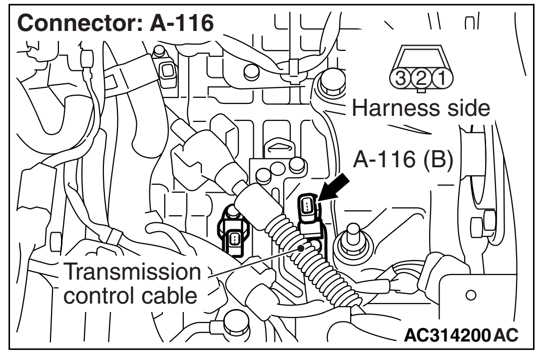

Check for the contact with terminals.

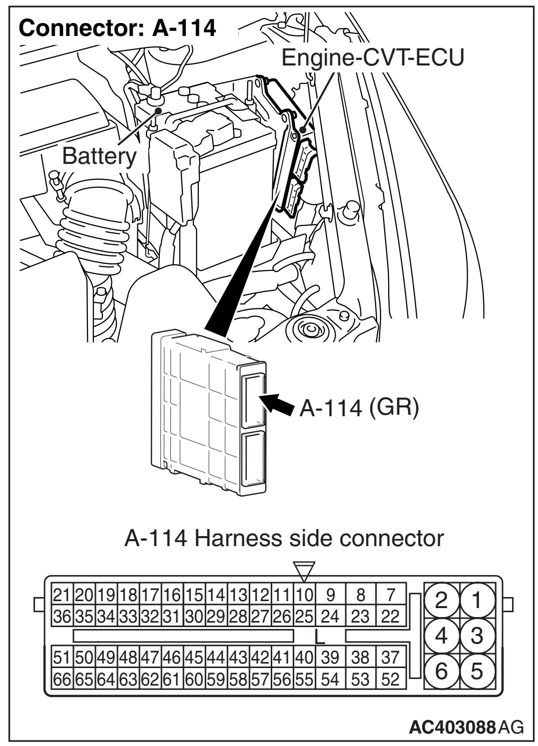
**Q: Is the check result normal?**

**YES :** Go to Step 32.

**NO :** Repair the defective connector.

**STEP 32. Check the harness between primary speed sensor connector A-116 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.60.**




Check the earth line for open circuit.

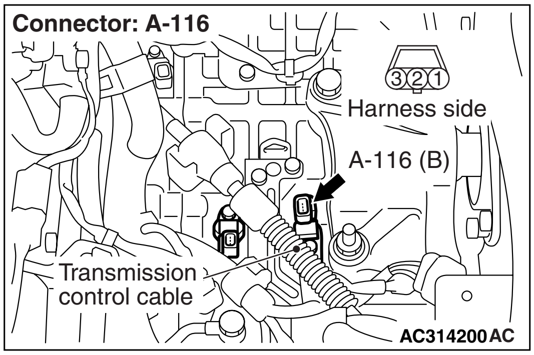
**Q: Is the check result normal?**

**YES :** Go to Step 30.

**NO :** Repair the wiring harness.

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### STEP 33. Measure the voltage at primary speed sensor connector A-116.

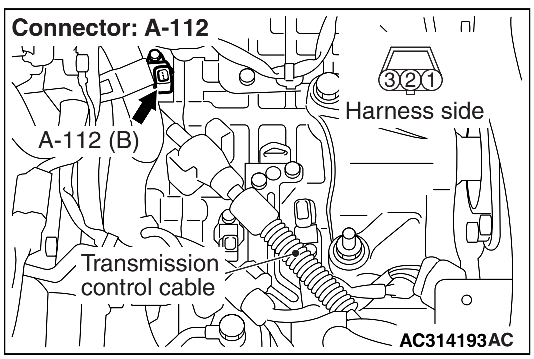


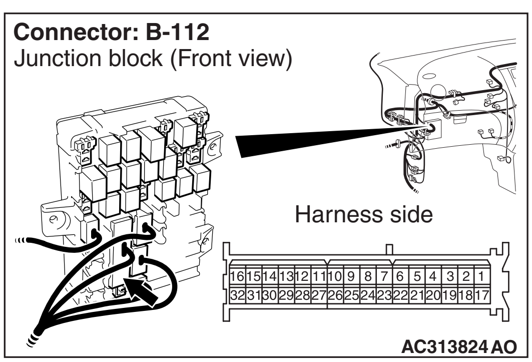

(1) Disconnect the connector, and measure the voltage between terminal 3 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: System voltage**

**Q: Is the check result normal?**
**YES :** Go to Step 36.
**NO :** Go to Step 34.

### STEP 34. Connectors check: A-17 intermediate connector, B-112 J/B connector.

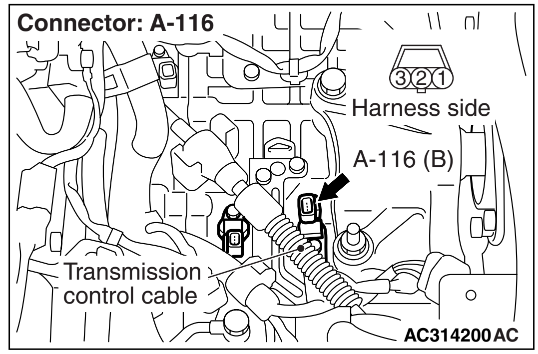


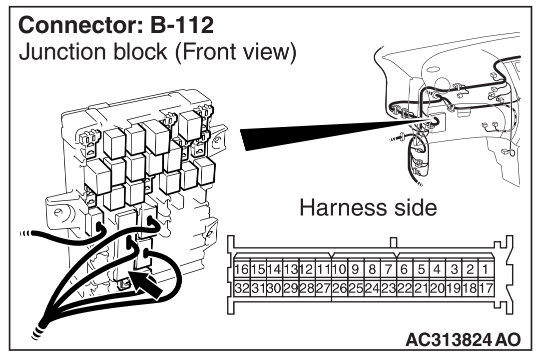




Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 35.
**NO :** Repair the defective connector.

### STEP 35. Check the harness between primary speed sensor connector A-116 terminal No.3 and J/B connector B-112 terminal No.6.

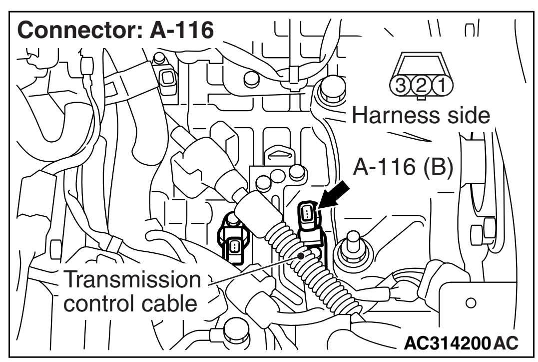



Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 30.
**NO :** Repair the wiring harness.

### STEP 36. Measure the voltage at primary speed sensor connector A-116.




(1) Disconnect the connector, and measure the voltage between terminal 2 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

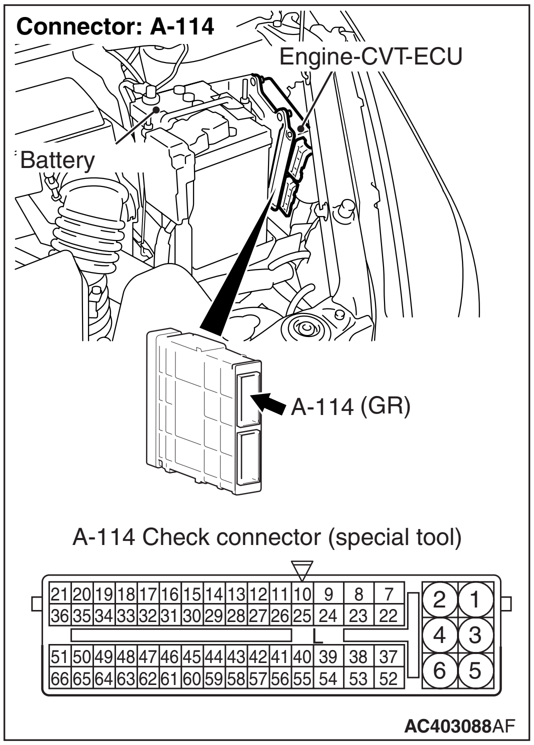
**OK: 4.9 – 5.1 V**

**Q: Is the check result normal?**
**YES :** Go to Step 42.
**NO :** Go to Step 37.

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**STEP 37. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect primary speed sensor connector A-116.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.43 and earth.

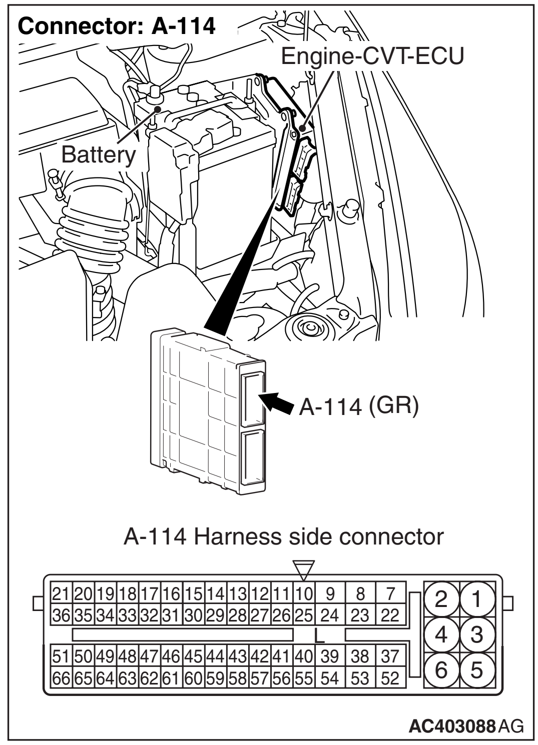
**OK: 4.9 – 5.1 V**

**Q: Is the check result normal?**

**YES : .** Go to Step 40.

**NO : .** Go to Step 38.

**STEP 38. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

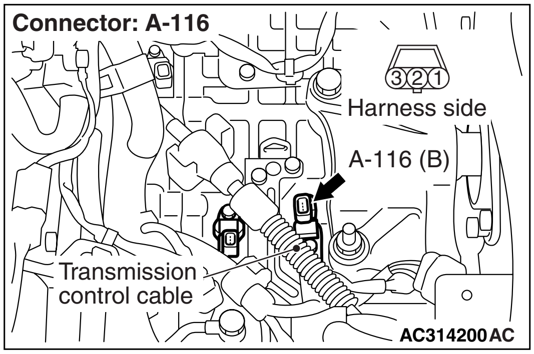
**Q: Is the check result normal?**

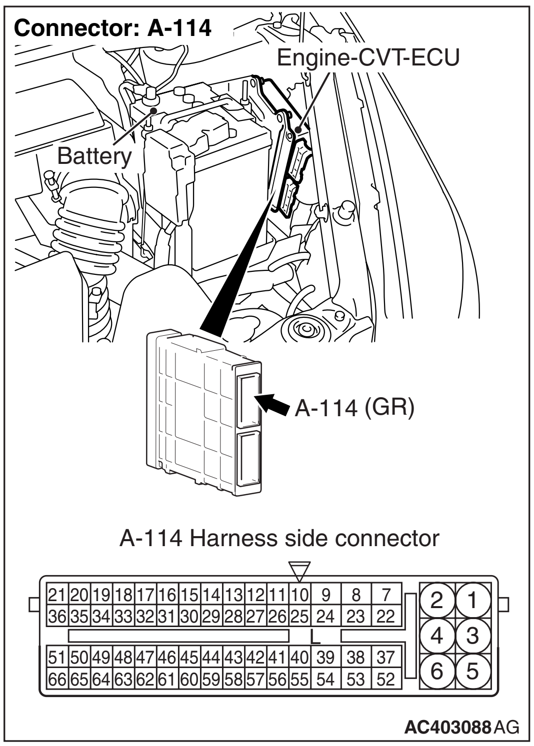
**YES :** Go to Step 39.

**NO :** Repair the defective connector.

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### STEP 39. Check the harness between primary speed sensor connector A-116 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.43.

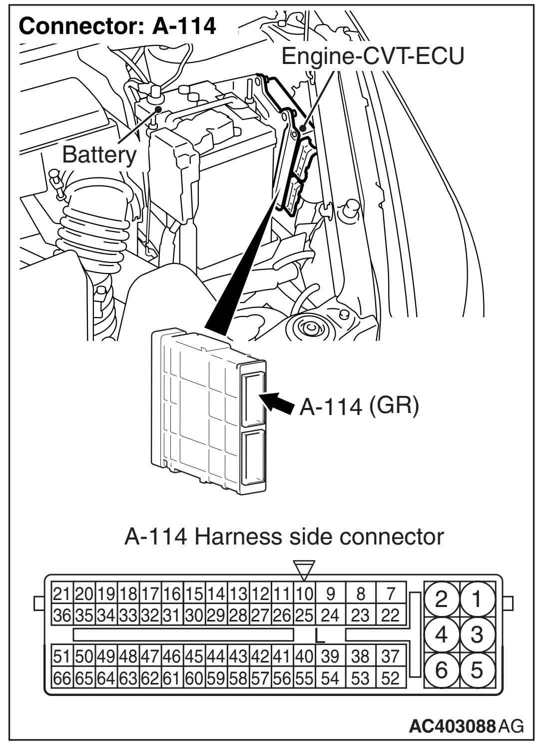



Check the output line for short-circuited.

**Q: Is the check result normal?**
- **YES :** Go to Step 30.
- **NO :** Repair the wiring harness.

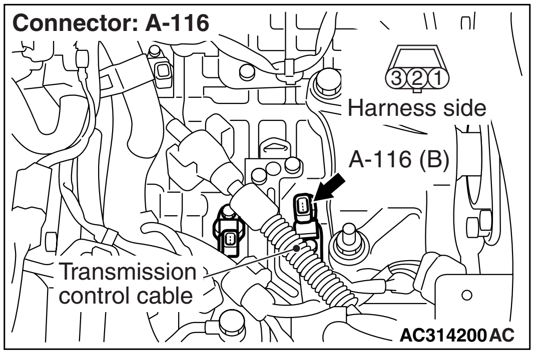
### STEP 40. Connector check: A-114 engine-CVT-ECU connector.

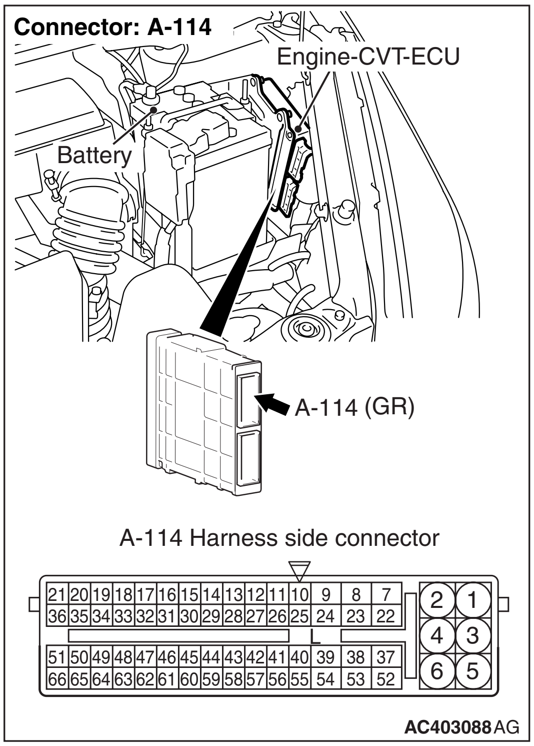



Check for the contact with terminals.

**Q: Is the check result normal?**
- **YES :** Go to Step 41.
- **NO :** Repair the defective connector.

### STEP 41. Check the harness between primary speed sensor connector A-116 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.43.



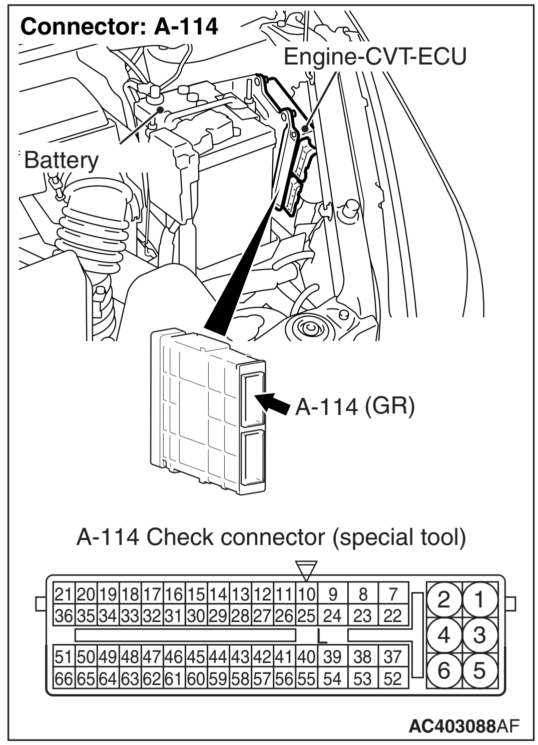

Check the output line for open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 30.

**NO :** Repair the wiring harness.

### STEP 42. Measure the output wave pattern of the primary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.43 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

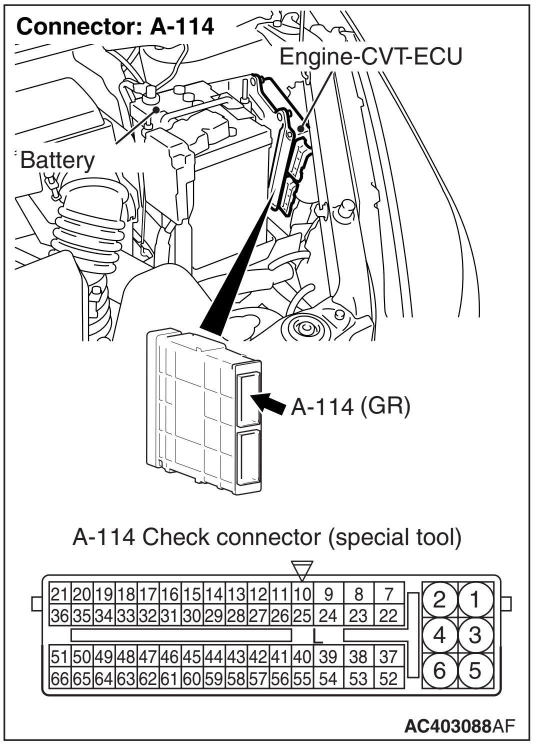
**Q: Is the check result normal?**

**YES :** Go to Step 43.

**NO :** Go to Step 44.

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**STEP 43. Measure the output wave pattern of the secondary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).**




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.45 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES : .** Go to Step 30.
**NO : .** Eliminate the cause of the noise.

**STEP 44. Check the primary speed sensor and then recheck the diagnosis code.**

(1) Remove the primary speed sensor. Wipe any metallic particles or dirt off the sensor tip.
(2) Install the primary speed sensor and road test the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Go to Step 45.
**NO :** The inspection is complete.

**STEP 45. Replace the primary speed sensor and then recheck the diagnosis code.**

(1) Replace the primary speed sensor. (Refer to P.23A-155).
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Go to Step 46.
**NO :** The inspection is complete.

**STEP 46. Replace the CVT assembly and then recheck the diagnosis code.**

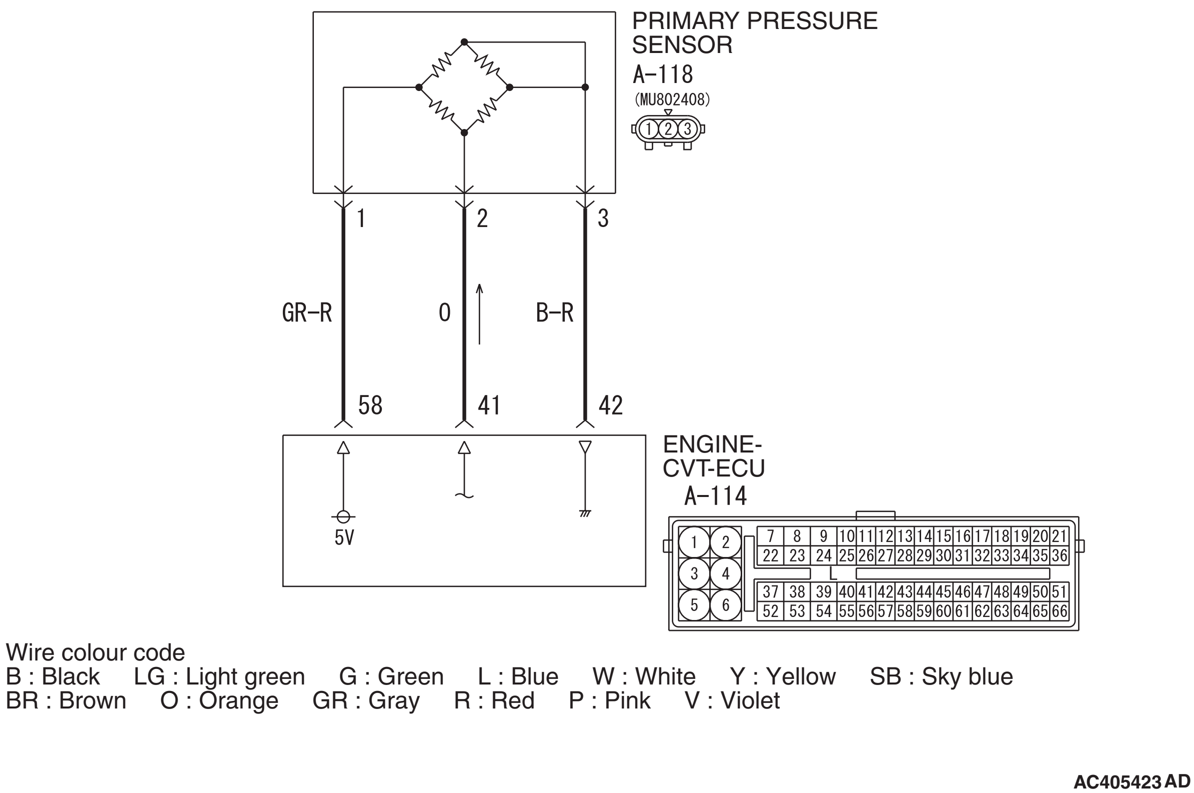
(1) Replace the CVT assembly.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**
**YES :** Eliminate the cause of the noise.
**NO :** The inspection is complete.

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## Code No.27, 28 Primary Pressure Sensor System

**Primary Pressure Sensor System Circuit**




## OPERATION

The primary pressure sensor measures the fluid pressure applied to the primary pulley.

## DIAGNOSIS CODE SET CONDITIONS

- If the primary pressure sensor output voltage is 0.2 V or less while the engine is running (engine speed is 450 r/min or more, and the relay voltage is 10 V or more), code No.27 will be set.
- If the primary pressure sensor output voltage is 4.7 V or more (fluid pressure is approximately 6.8 MPa or more) while the relay voltage is 10 V or more, code No.28 will be set.

## PROBABLE CAUSES

- Malfunction of primary pressure sensor
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III data list

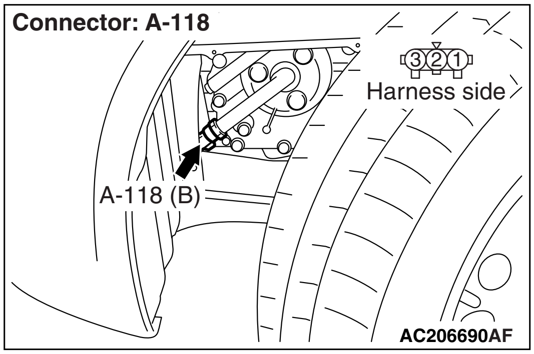
Item 11: Primary pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Go to Step 2.

### STEP 2. Connector check: A-118 primary pressure sensor connector.



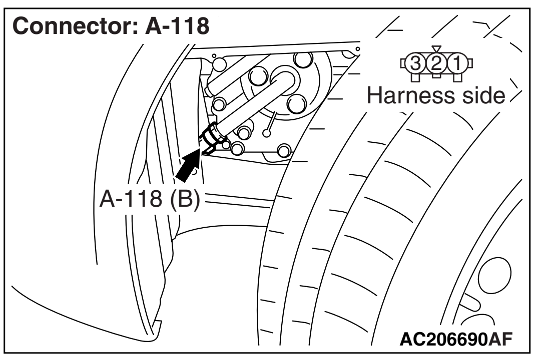

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 3.

**NO :** Repair the defective connector.

### STEP 3. Measure the resistance at primary pressure sensor connector A-118.




Disconnect the connector, and measure the resistance between terminal 3 and earth at the wiring harness side.

**OK: 2 Ω or less**

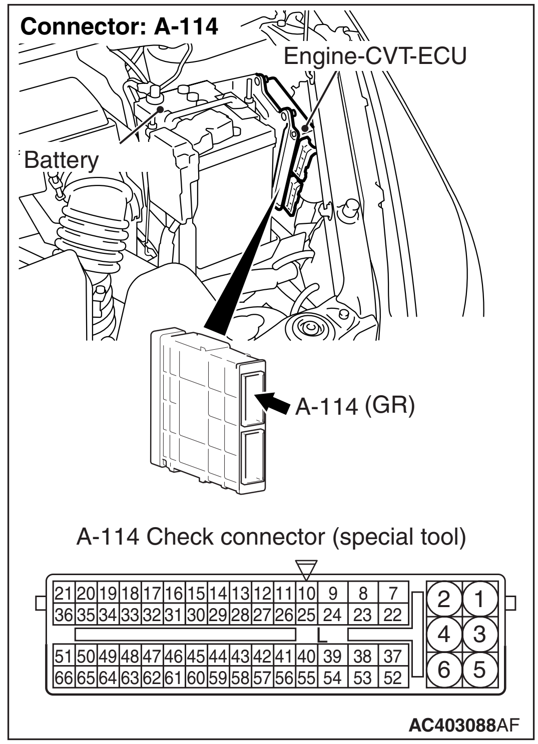
**Q: Is the check result normal?**

**YES :** Go to Step 9.

**NO :** Go to Step 4.

### STEP 4. Measure the voltage at engine-CVT-ECU connector A-114.

(1) Connect primary pressure sensor connector A-118.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.42 and earth.

**OK: 0.5 V or less**

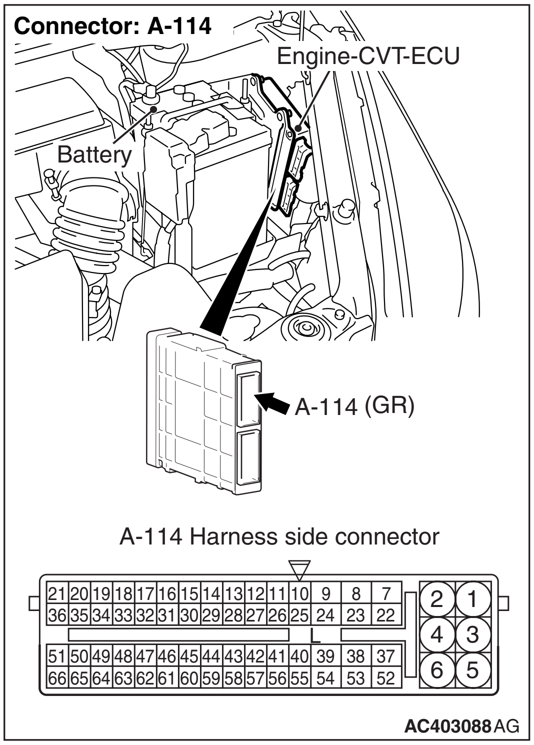
**Q: Is the check result normal?**

**YES :** Go to Step 7.

**NO :** Go to Step 5.

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### STEP 5. Connector check: A-114 engine-CVT-ECU connector.




Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the defective connector.

### STEP 6. M.U.T.-III data list

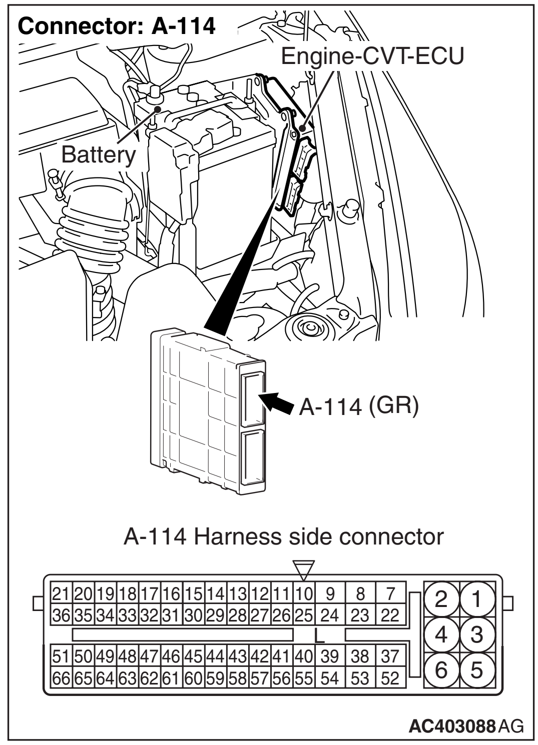
Item 11: Primary pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Replace the engine-CVT-ECU.

### STEP 7. Connector check: A-114 engine-CVT-ECU connector.




Check for the contact with terminals.

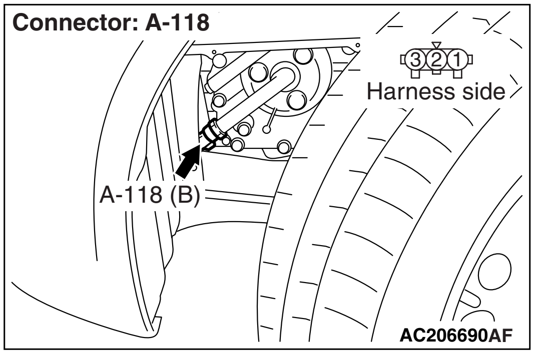
**Q: Is the check result normal?**

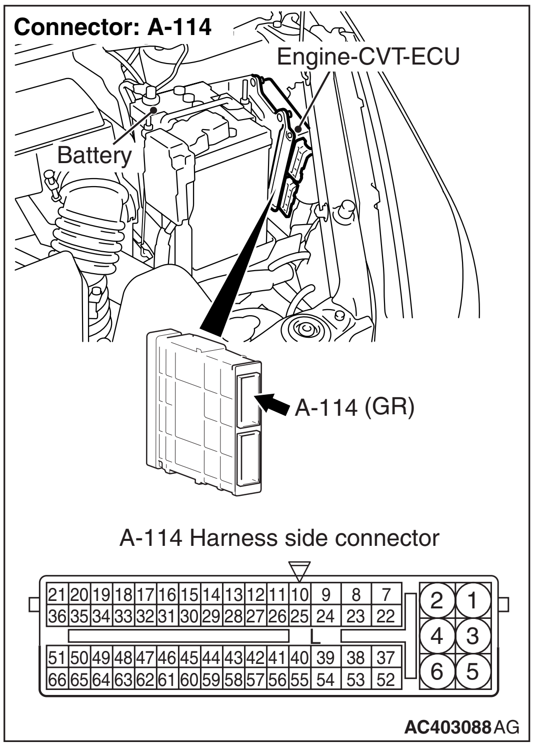
**YES :** Go to Step 8.

**NO :** Repair the defective connector.

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**STEP 8. Check the harness between primary pressure sensor connector A-118 terminal No.3 and engine-CVT-ECU connector A-114 terminal No.42.**



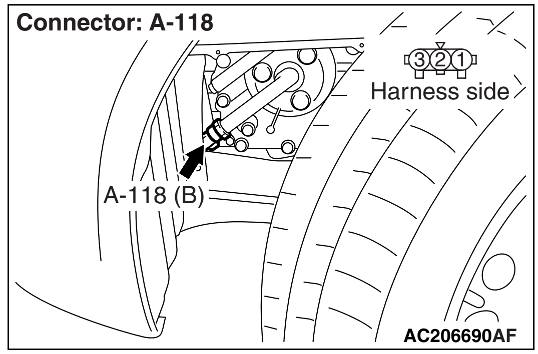

Check the earth line for open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

**STEP 9. Measure the voltage at primary pressure sensor connector A-118.**




(1) Disconnect the connector, and measure the voltage between terminal 1 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: 4.9 – 5.1 V**

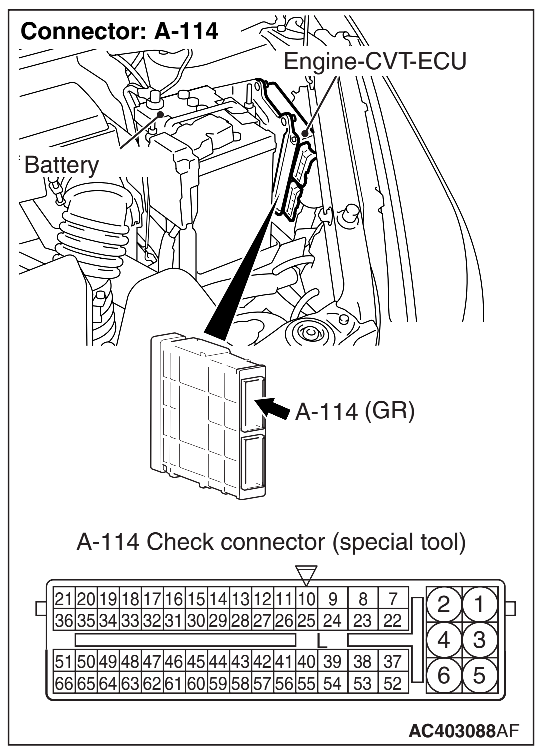
**Q: Is the check result normal?**

**YES :** Go to Step 15.

**NO :** Go to Step 10.

**STEP 10. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect primary pressure sensor connector A-118.



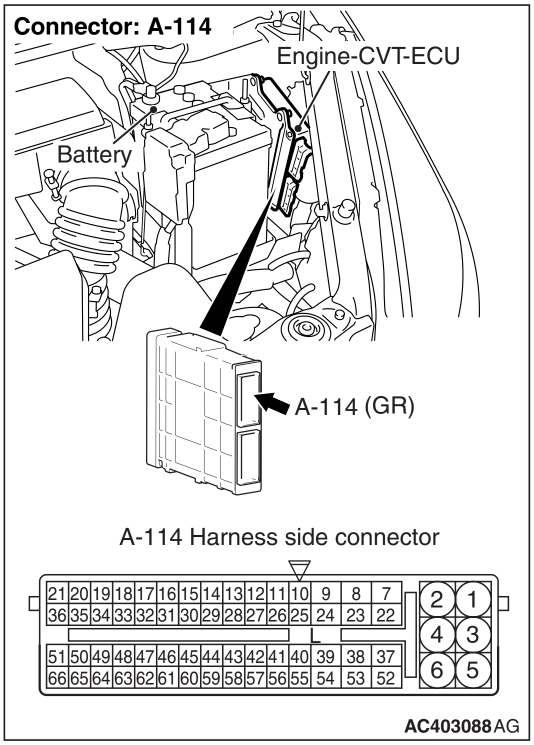

(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.58 and earth.

**OK: 4.9 − 5.1 V**

**Q: Is the check result normal?**
**YES :** Go to Step 13.
**NO :** Go to Step 11.

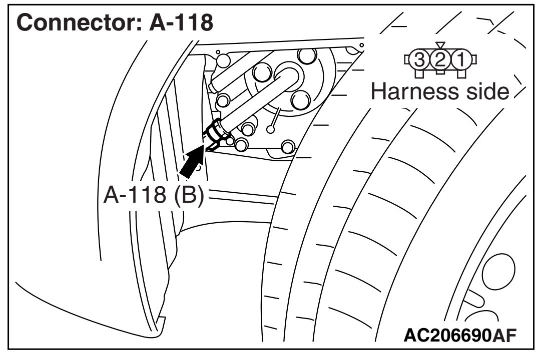
### STEP 11. Connector check: A-114 engine-CVT-ECU connector.

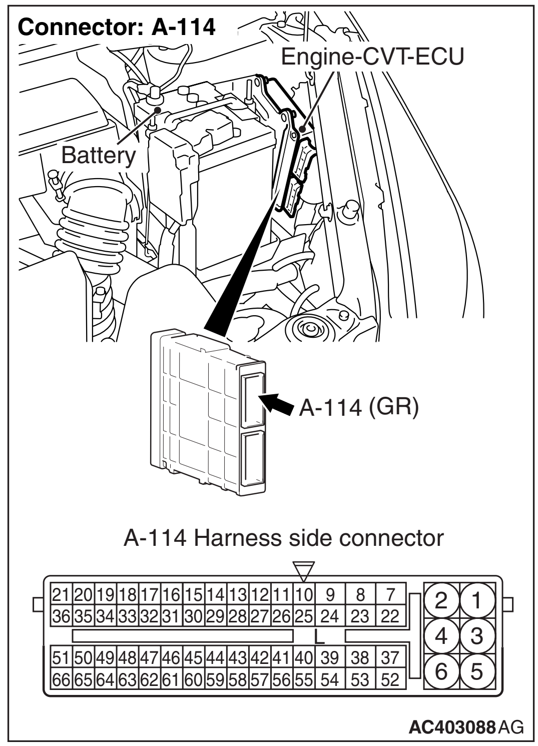



Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Repair the defective connector.

### STEP 12. Check the harness between primary pressure sensor connector A-118 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.58.



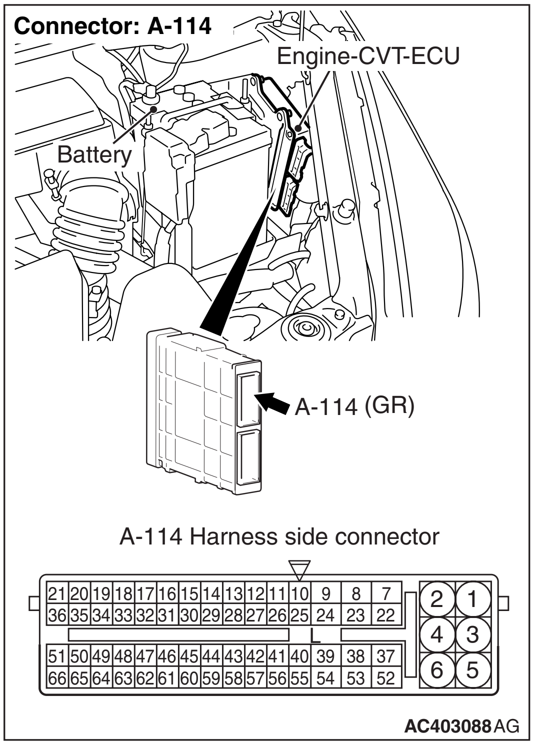




Check the power supply line for short-circuited.

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Repair the wiring harness.

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### STEP 13. Connector check: A-114 engine-CVT-ECU connector.



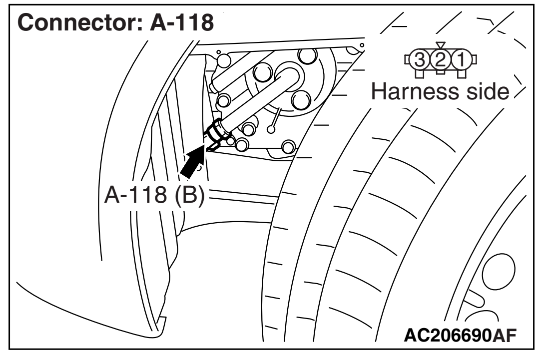

Check for the contact with terminals.

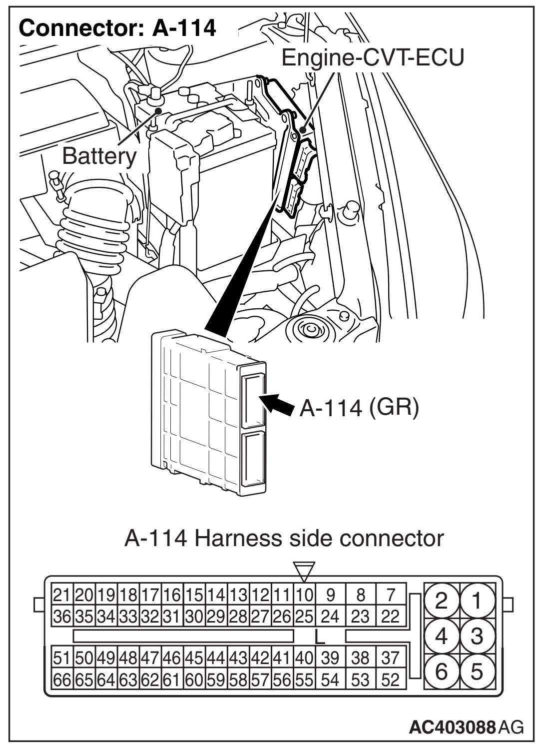
**Q: Is the check result normal?**

**YES :** Go to Step 14.

**NO :** Repair the defective connector.

### STEP 14. Check the harness between primary pressure sensor connector A-118 terminal No.1 and engine-CVT-ECU connector A-114 terminal No.58.




Check the power supply line for open circuit.

**Q: Is the check result normal?**

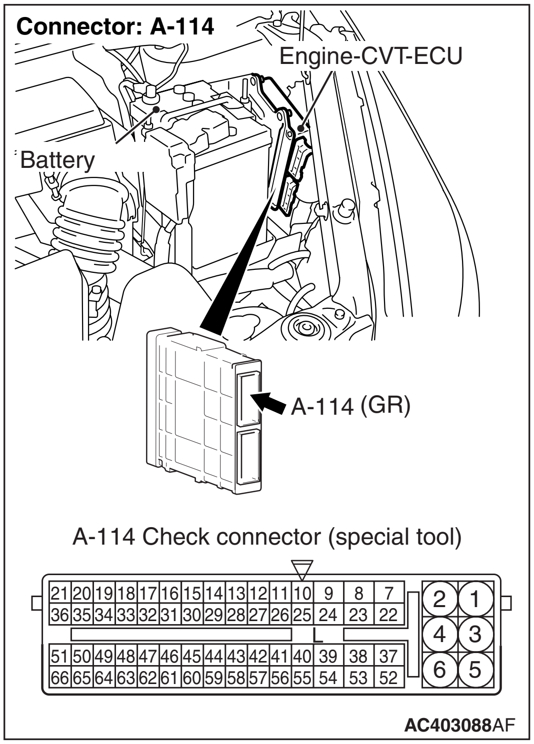
**YES :** Go to Step 6.

**NO :** Repair the wiring harness.

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**STEP 15. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect primary pressure sensor connector A-118.

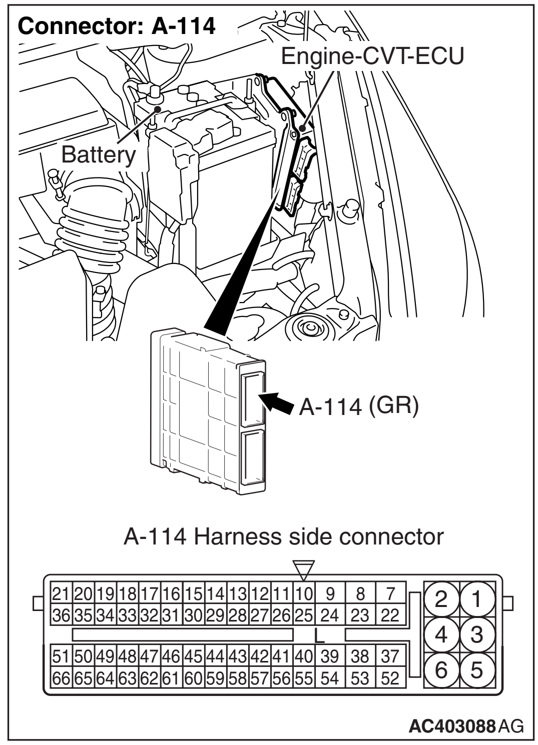



(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Let the engine run at idle.
(4) Shift the selector lever to the P range.
(5) Close the accelerator pedal fully.
(6) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.41 and earth.

**OK: 0.5 – 0.9 V**

**Q: Is the check result normal?**
**YES : .** Go to Step 18.
**NO : .** Go to Step 16.

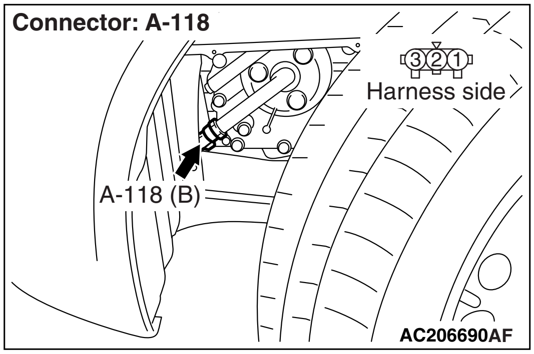
**STEP 16. Connector check: A-114 engine-CVT-ECU connector.**

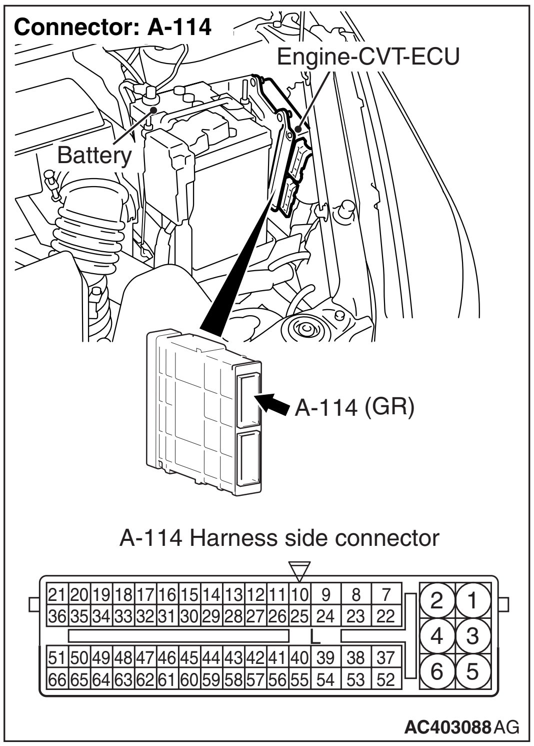



Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 17.
**NO :** Repair the defective connector.

**STEP 17. Check the harness between primary pressure sensor connector A-118 terminal No.2 and engine-CVT-ECU connector A-114 terminal No.41.**



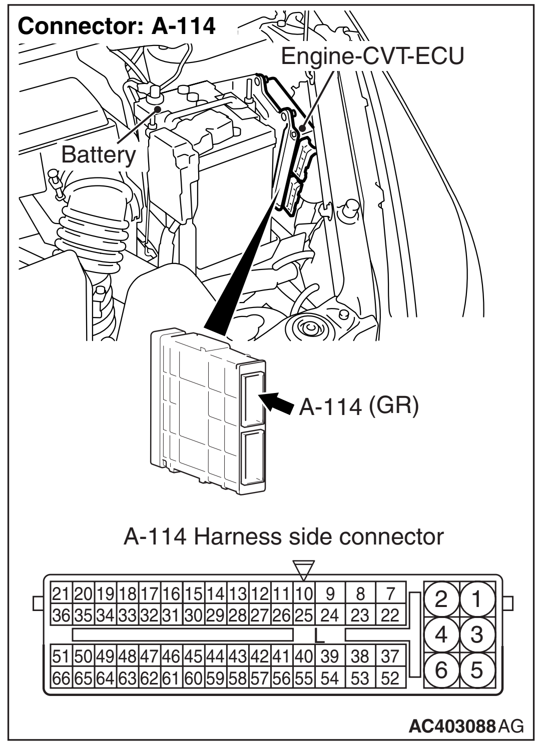

Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Replace the primary pressure sensor. (Refer to P.23A-155).

**NO :** Repair the wiring harness.

**STEP 18. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

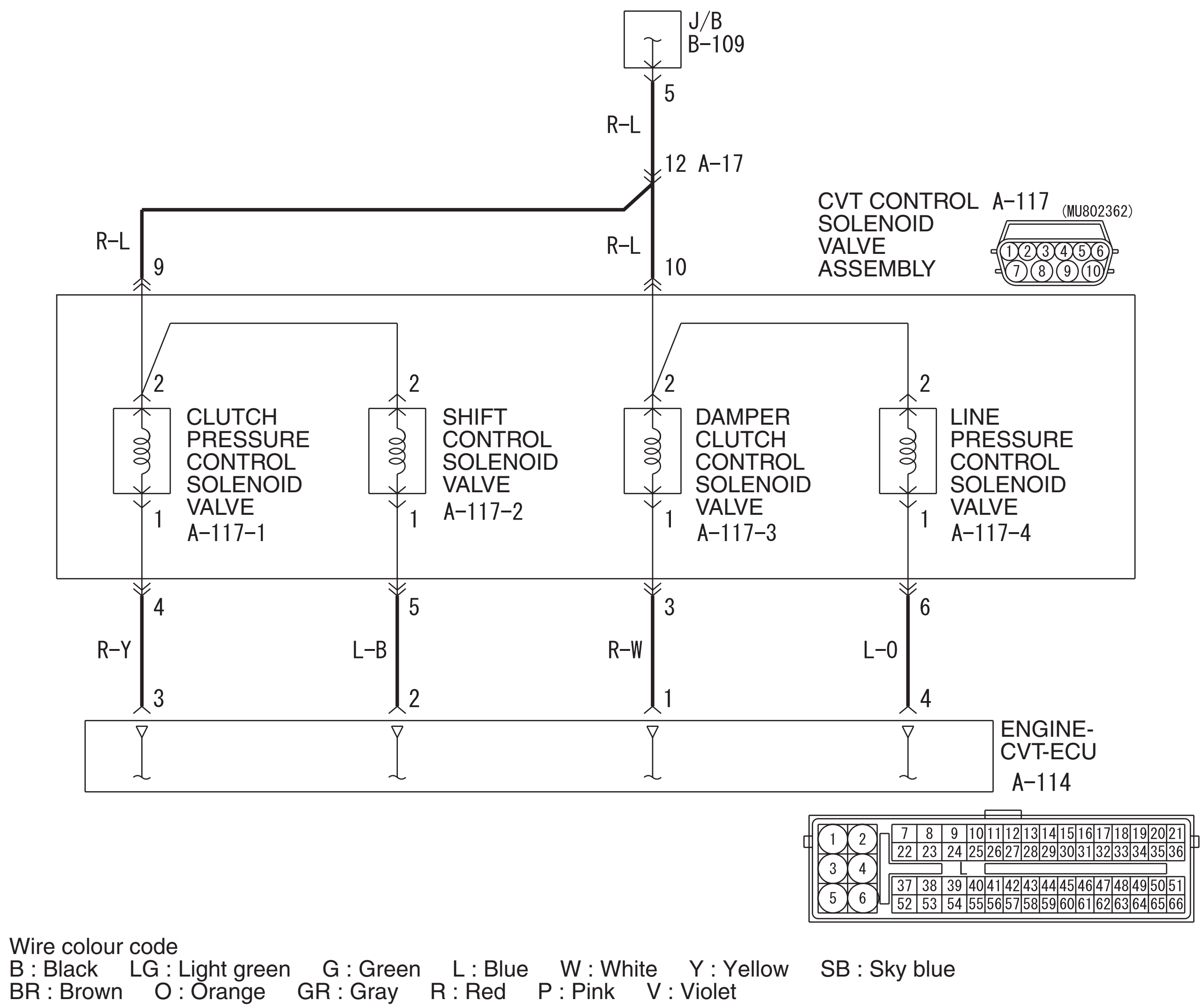
**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Repair the defective connector.

## Code No.31 Line Pressure Control Solenoid Valve System

**Solenoid Valve System Circuit**




AC405424

## OPERATION

The line pressure control solenoid valve controls the fluid pressure applied on the secondary pulley by using the signal from the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

If the line pressure control solenoid valve driving voltage is 3 V or less, code No.31 will be set.

## PROBABLE CAUSES

- Malfunction of line pressure control solenoid valve
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III diagnosis code

**Q: Are diagnosis codes 33, 37 set?**

**YES :** Go to Step 9.
**NO :** Go to Step 2.

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**STEP 2. M.U.T.-III actuator test**

Item 01: Line pressure control solenoid valve

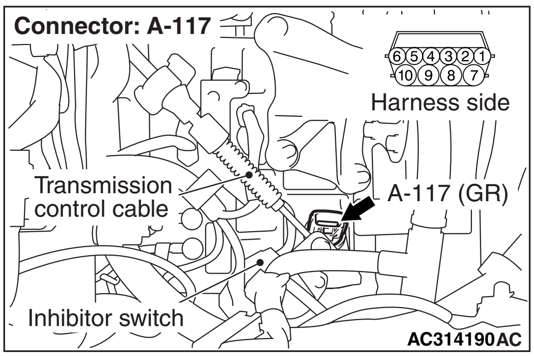
**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Go to Step 3.

**STEP 3. Connector check: A-117 CVT control solenoid valve assembly connector.**



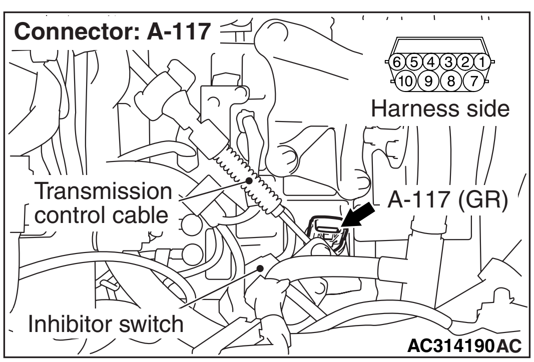

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 4.

**NO :** Repair the defective connector.

**STEP 4. Measure the resistance at CVT control solenoid valve assembly connector A-117.**




Disconnect the connector, and measure the resistance between terminal 6 and 10 at the solenoid valve side.

**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

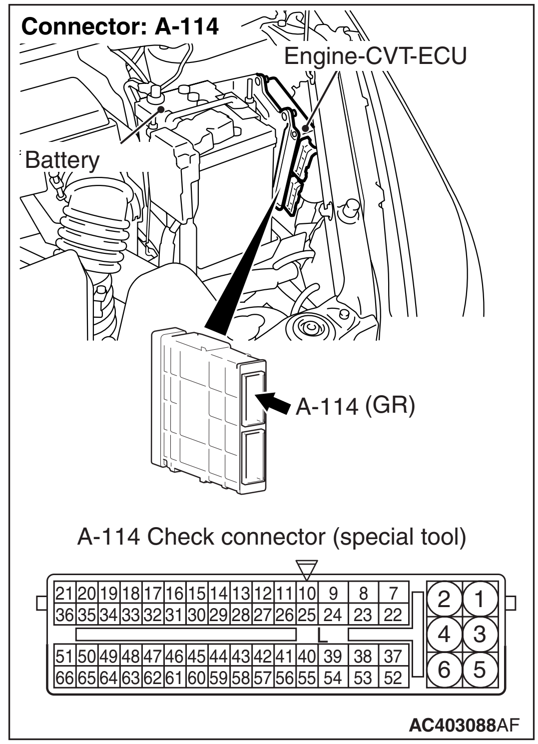
**Q: Is the check result normal?**

**YES :** Go to Step 5.

**NO :** Replace the line pressure control solenoid valve. (Refer to P.23A-155).

**STEP 5. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect CVT control solenoid valve assembly connector A-117.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Let the engine run at idle.

(4) Shift the selector lever to the P range.

(5) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.4 and earth.

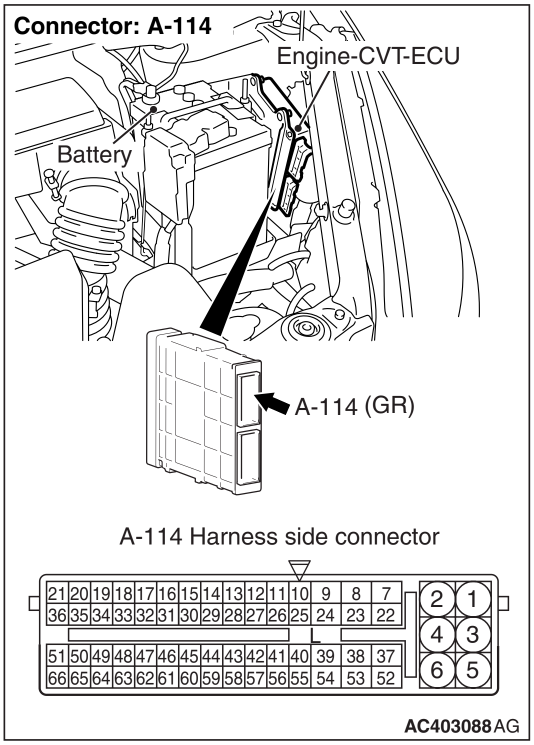
**OK: 10 – 11 V**

**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Go to Step 6.

### STEP 6. Connector check: A-114 engine-CVT-ECU connector.

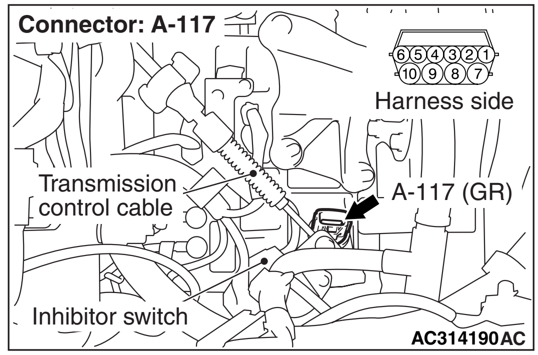


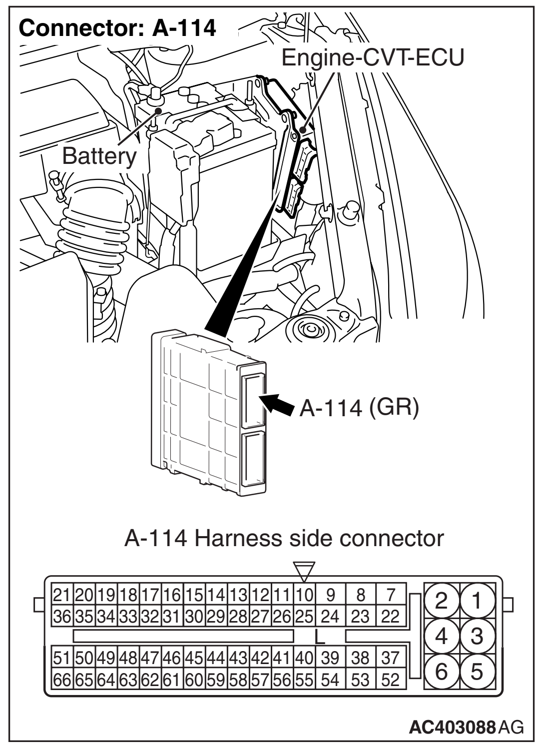

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 7.
**NO :** Repair the defective connector.

### STEP 7. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.6 and engine-CVT-ECU connector A-114 terminal No.4.




Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

### STEP 8. M.U.T.-III actuator test

Item 01: Line pressure control solenoid valve

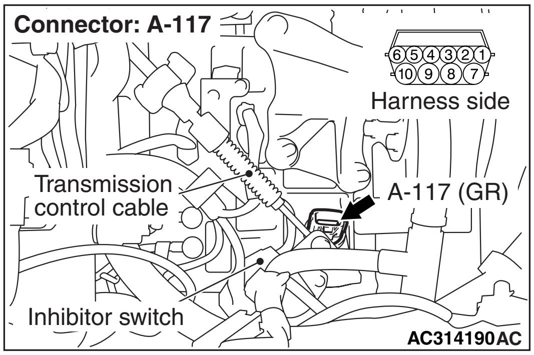
**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

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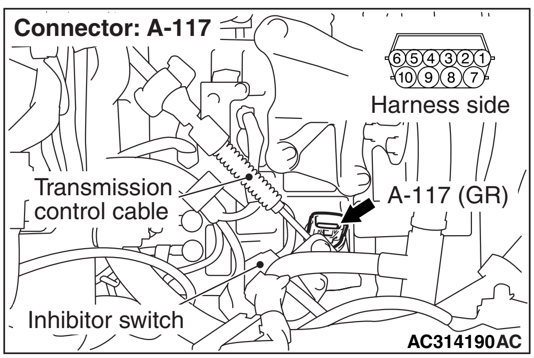
### STEP 9. Connector check: A-117 CVT control solenoid valve assembly connector.




Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 10.
**NO :** Repair the defective connector.

### STEP 10. Measure the resistance at CVT control solenoid valve assembly connector A-117.

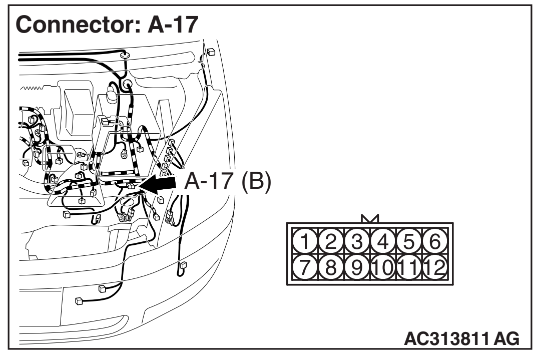


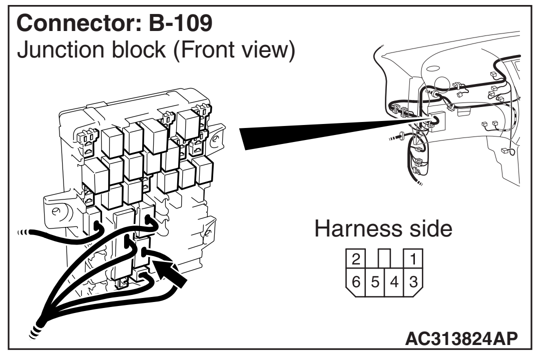

Disconnect the connector, and measure the resistance between terminal 6 and 10 at the solenoid valve side.

**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

**Q: Is the check result normal?**
**YES :** Go to Step 11.
**NO :** Check the solenoid valve harness.

### STEP 11. Connectors check: A-17 intermediate connector, B-109 J/B connector.



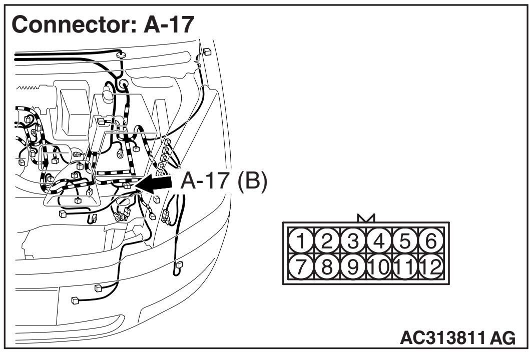



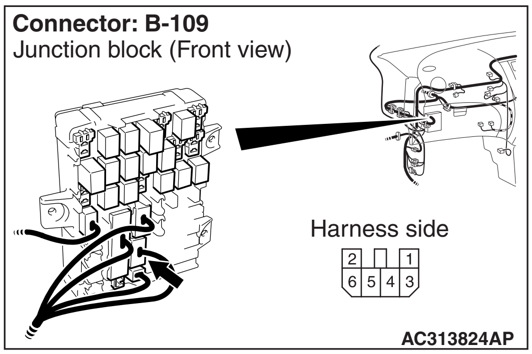

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 12.
**NO :** Repair the defective connector.

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**STEP 12. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.10 and J/B connector B-109 terminal No.5.**




Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Repair the wiring harness.

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**Code No.32, 36 Shift Control Solenoid Valve System**

## SOLENOID VALVE SYSTEM CIRCUIT

Refer to P.23A-77.

## OPERATION

The shift control solenoid valve controls the CVT gear ratio by using the signal from the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

- If the shift control solenoid valve driving voltage is 3 V or less, code No.32 will be set.
- If the primary pressure is approximately 0.5 MPa or less when code No.32 is set, code No.36 will be set.

## PROBABLE CAUSES

- Malfunction of shift control solenoid valve
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III diagnosis code

**Q: Are diagnosis codes 34, 38 set?**

**YES :** Go to Step 9.
**NO :** Go to Step 2.

### STEP 2. M.U.T.-III actuator test

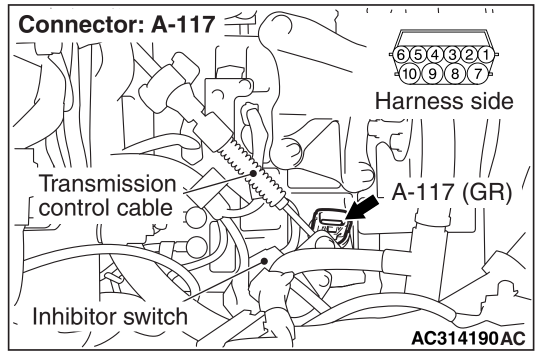
Item 02: Shift control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Go to Step 3.

### STEP 3. Connector check: A-117 CVT control solenoid valve assembly connector.

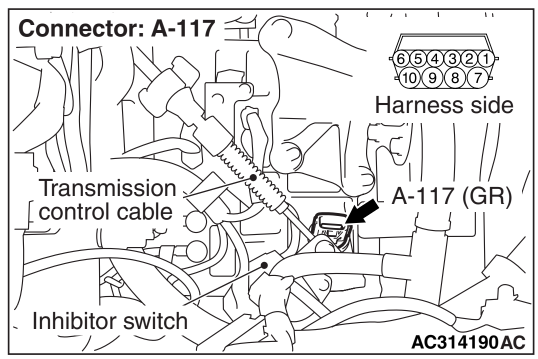



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Repair the defective connector.

### STEP 4. Measure the resistance at CVT control solenoid valve assembly connector A-117.




Disconnect the connector, and measure the resistance between terminal 5 and 9 at the solenoid valve side.

**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

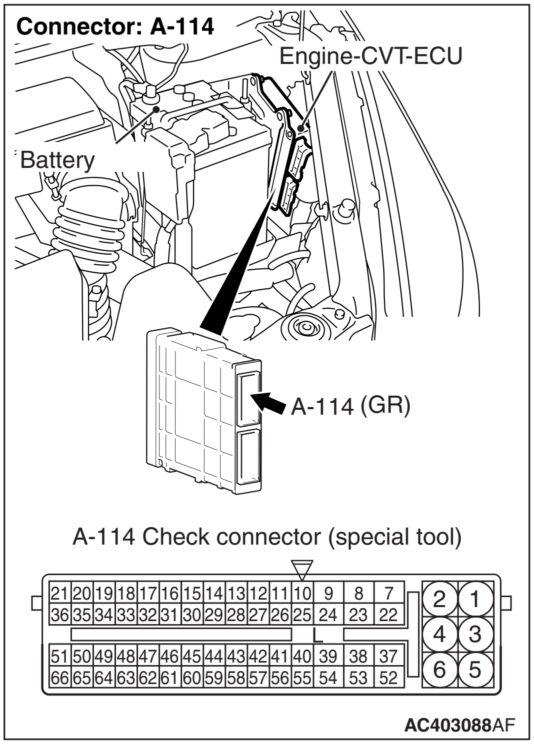
**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Replace the valve body assembly. (Refer to P.23A-155).

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**STEP 5. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect CVT control solenoid valve assembly connector A-117.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Let the engine run at idle.

(4) Shift the selector lever to the P range.

(5) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.2 and earth.

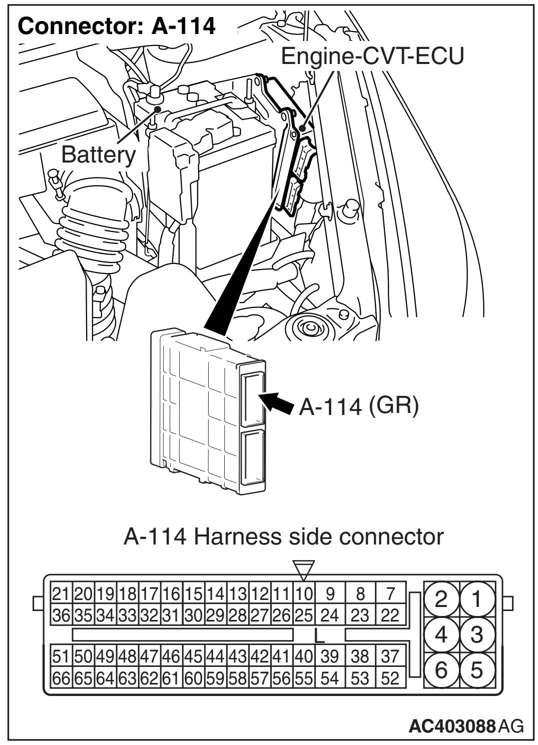
**OK: Approximately 11 V**

**Q: Is the check result normal?**

**YES : .** Go to Step 8.

**NO :** Go to Step 6.

**STEP 6. Connector check: A-114 engine-CVT-ECU connector.**




Check for the contact with terminals.

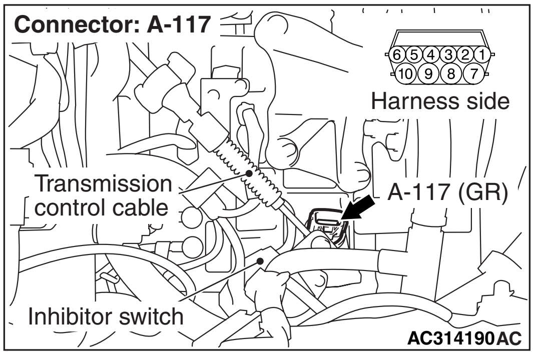
**Q: Is the check result normal?**

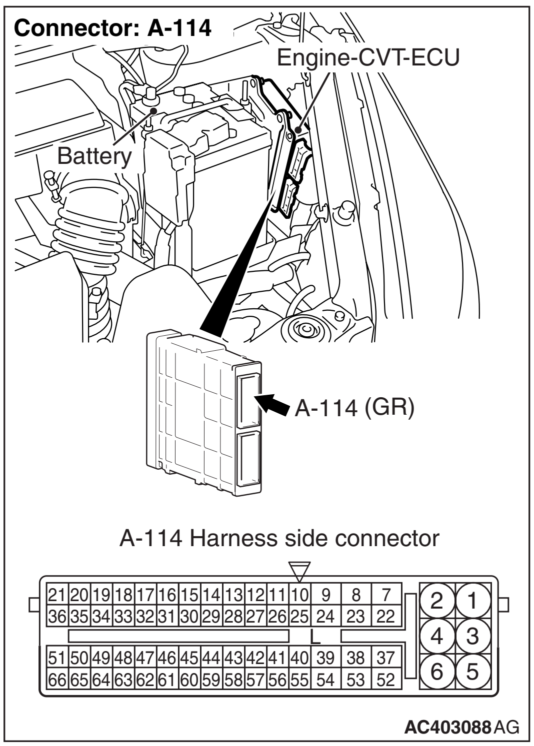
**YES :** Go to Step 7.

**NO :** Repair the defective connector.

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**STEP 7. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.5 and engine-CVT-ECU connector A-114 terminal No.2.**




Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

**STEP 8. M.U.T.-III actuator test**

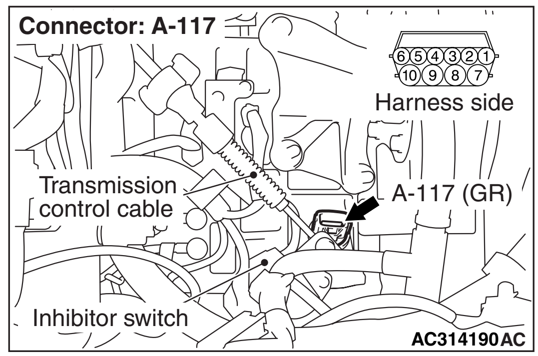
Item 02: Shift control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

**STEP 9. Connector check: A-117 CVT control solenoid valve assembly connector.**

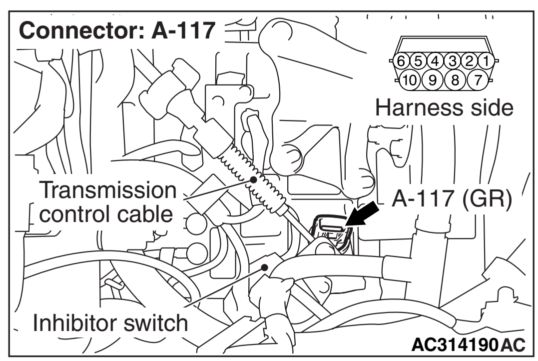



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 10.
**NO :** Repair the defective connector.

**STEP 10. Measure the resistance at CVT control solenoid valve assembly connector A-117.**




Disconnect the connector, and measure the resistance between terminal 5 and 9 at the solenoid valve side.

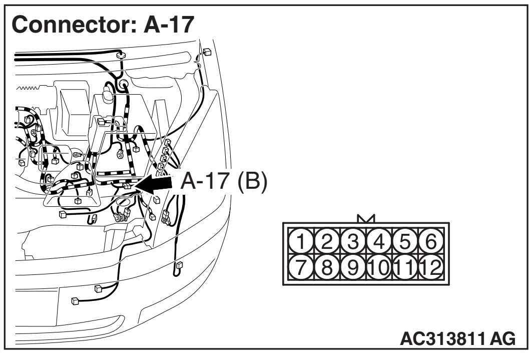
**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

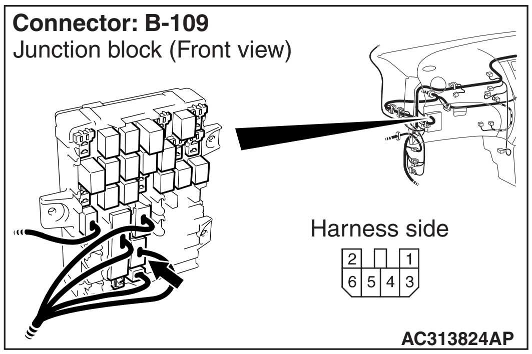
**Q: Is the check result normal?**

**YES :** Go to Step 11.
**NO :** Check the solenoid valve harness.

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### STEP 11. Connectors check: A-17 intermediate connector, B-109 J/B connector.



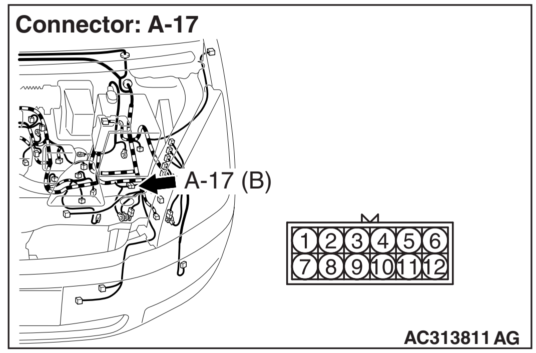

Check for the contact with terminals.

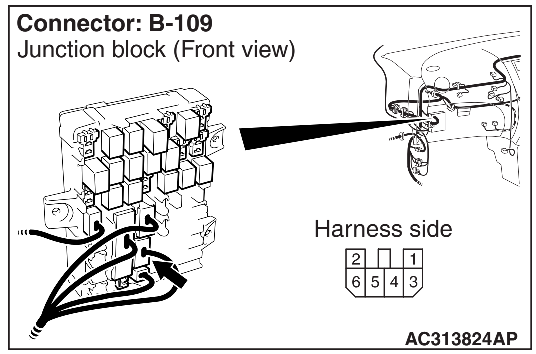
**Q: Is the check result normal?**

**YES :** Go to Step 12.

**NO :** Repair the defective connector.

### STEP 12. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.9 and J/B connector B-109 terminal No.5.




Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Repair the wiring harness.

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### Code No.33, 37 Damper Clutch Control Solenoid Valve System

## SOLENOID VALVE SYSTEM CIRCUIT

Refer to P.23A-77.

## OPERATION

The damper clutch control solenoid valve engages or disengages the torque converter by using the signal from the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

- If the damper clutch control solenoid valve driving voltage is 3 V or less, code No.33 will be set.
- If the difference between the engine speed and the turbine speed sensor output is 100 r/min or less when code No.33 is set, code No.37 will be set.

## PROBABLE CAUSES

- Malfunction of damper clutch control solenoid valve
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III diagnosis code

**Q: Is diagnosis code 31 set?**

**YES :** Go to Step 9.
**NO :** Go to Step 2.

### STEP 2. M.U.T.-III actuator test

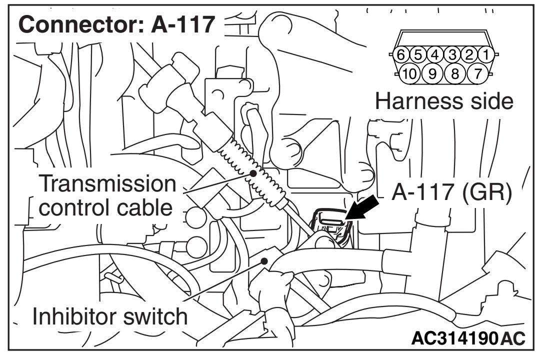
Item 03: Damper clutch control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Go to Step 3.

### STEP 3. Connector check: A-117 CVT control solenoid valve assembly connector.

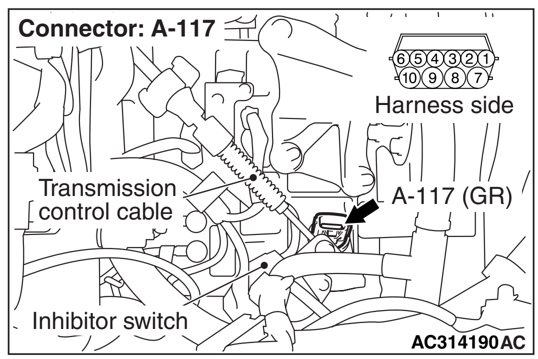



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Repair the defective connector.

### STEP 4. Measure the resistance at CVT control solenoid valve assembly connector A-117.




Disconnect the connector, and measure the resistance between terminal 3 and 10 at the solenoid valve side.

**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

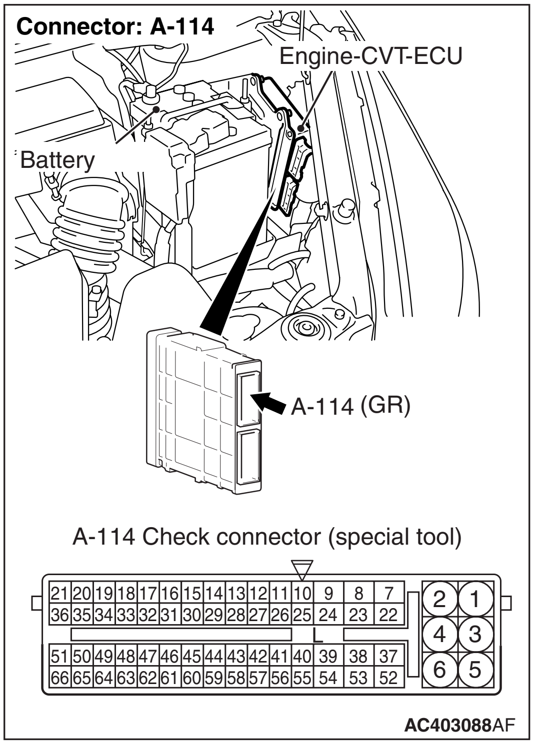
**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Replace the damper clutch control solenoid valve. (Refer to P.23A-155).

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**STEP 5. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect CVT control solenoid valve assembly connector A-117.

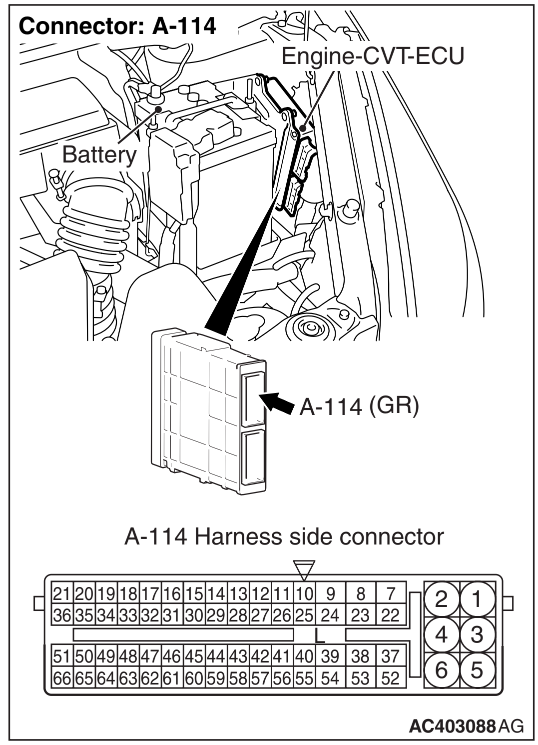



(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Let the engine run at idle.
(4) Shift the selector lever to the P range.
(5) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.1 and earth.

**OK: System voltage**

**Q: Is the check result normal?**
**YES : .** Go to Step 8.
**NO : .** Go to Step 6.

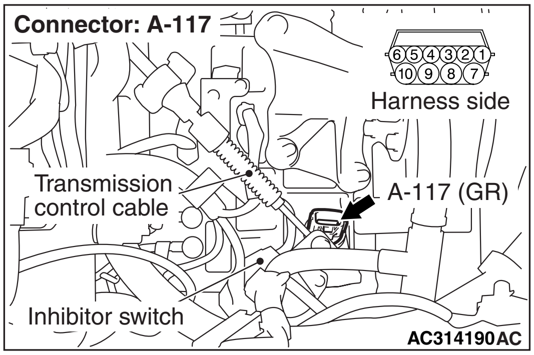
**STEP 6. Connector check: A-114 engine-CVT-ECU connector.**

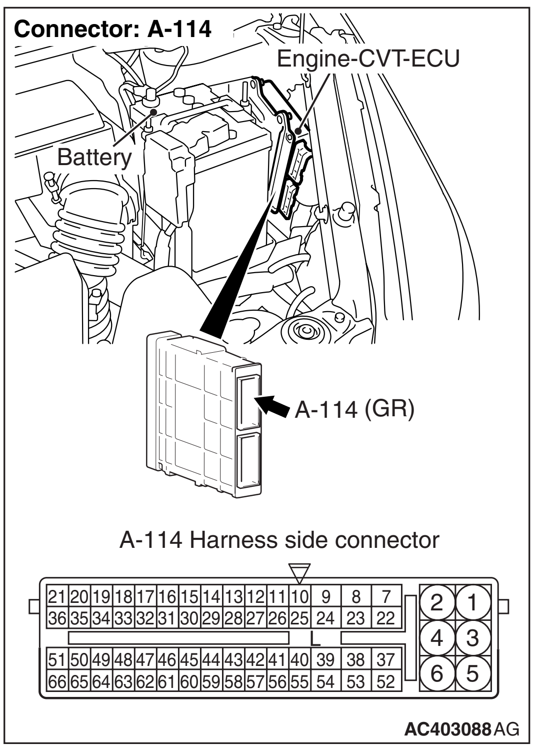



Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 7.
**NO :** Repair the defective connector.

**STEP 7. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.3 and engine-CVT-ECU connector A-114 terminal No.1.**




Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

**STEP 8. M.U.T.-III actuator test**

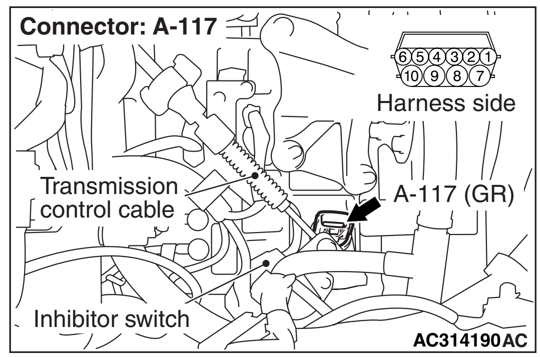
Item 03: Damper clutch control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

**STEP 9. Connector check: A-117 CVT control solenoid valve assembly connector.**

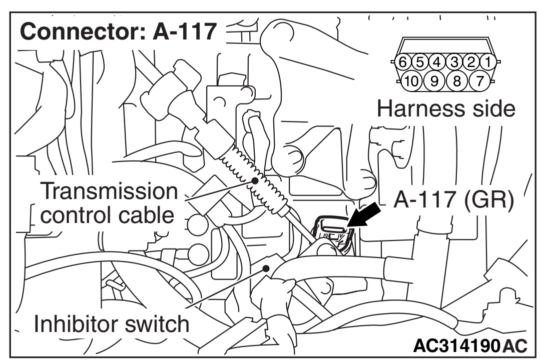



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 10.
**NO :** Repair the defective connector.

**STEP 10. Measure the resistance at CVT control solenoid valve assembly connector A-117.**




Disconnect the connector, and measure the resistance between terminal 3 and 10 at the solenoid valve side.

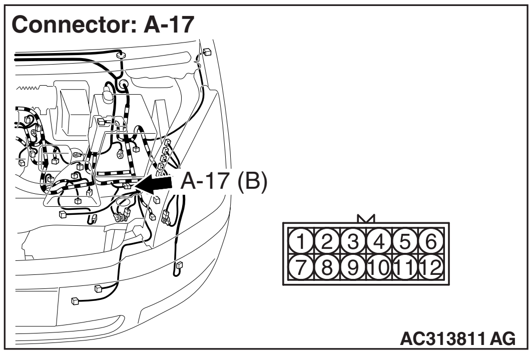
**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

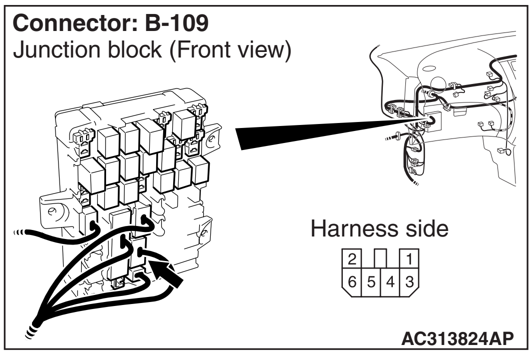
**Q: Is the check result normal?**

**YES :** Go to Step 11.
**NO :** Check the solenoid valve harness.

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**STEP 11. Connectors check: A-17 intermediate connector, B-109 J/B connector.**



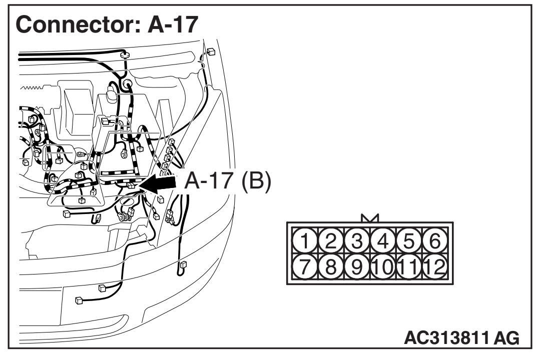



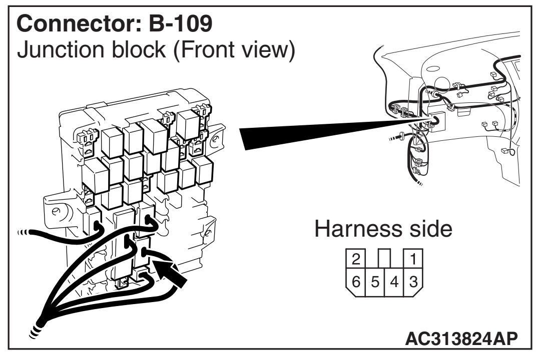

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 12.
**NO :** Repair the defective connector.

**STEP 12. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.10 and J/B connector B-109 terminal No.5.**




Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

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## Code No.34, 38 Clutch Pressure Control Solenoid Valve System

### SOLENOID VALVE SYSTEM CIRCUIT

Refer to P.23A-77.

### OPERATION

The clutch pressure control solenoid valve controls the fluid pressure to the forward clutch and the reverse brake by using signals from the engine-CVT-ECU.

### DIAGNOSIS CODE SET CONDITIONS

- If the clutch pressure control solenoid valve driving voltage is 3 V or less, code No.34 will be set.
- If the difference between the primary speed sensor output and the turbine speed sensor output is 100 r/min or less when code No.34 is set, code No.38 will be set.

### PROBABLE CAUSES

- Malfunction of clutch pressure control solenoid valve
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

### DIAGNOSIS PROCEDURE

#### STEP 1. M.U.T.-III diagnosis code

**Q: Are diagnosis codes 32, 36 set?**

**YES :** Go to Step 9.
**NO :** Go to Step 2.

#### STEP 2. M.U.T.-III actuator test

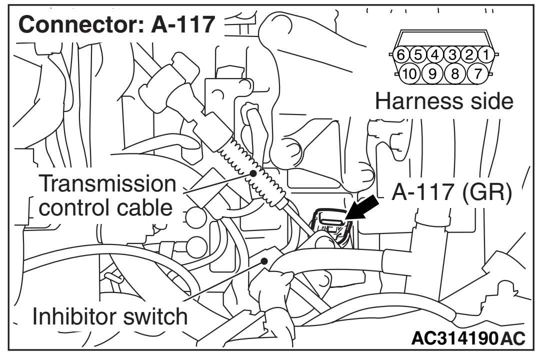
Item 04: Clutch pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Go to Step 3.

#### STEP 3. Connector check: A-117 CVT control solenoid valve assembly connector.

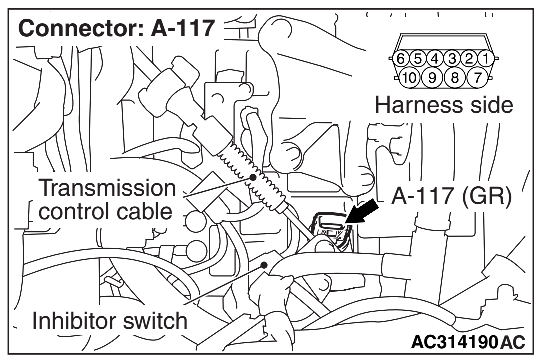



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Repair the defective connector.

#### STEP 4. Measure the resistance at CVT control solenoid valve assembly connector A-117.




Disconnect the connector, and measure the resistance between terminal 4 and 9 at the solenoid valve side.

**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

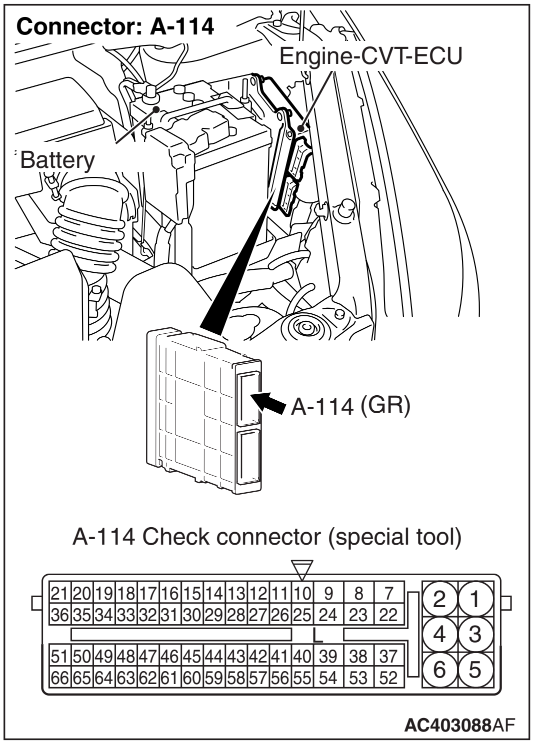
**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Replace the clutch pressure control solenoid valve. (Refer to P.23A-155).

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**STEP 5. Measure the voltage at engine-CVT-ECU connector A-114.**

(1) Connect CVT control solenoid valve assembly connector A-117.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Let the engine run at idle.

(4) Move the selector lever from N to D range, or from N range to R range.

(5) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.3 and earth.

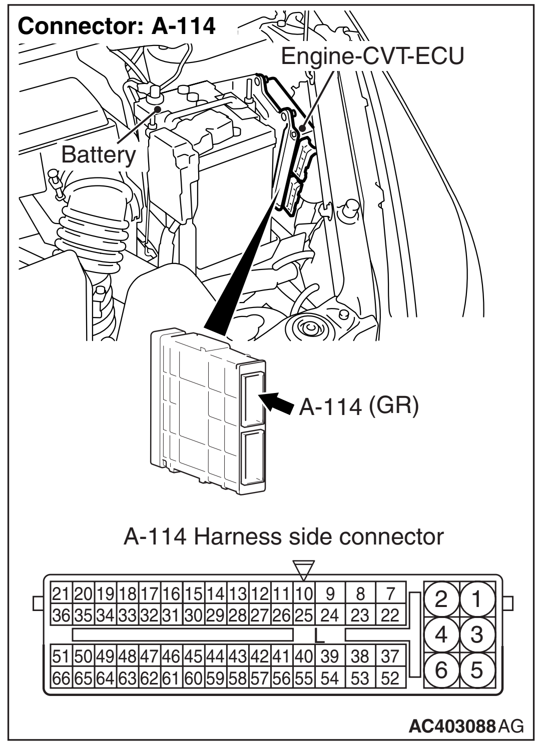
**OK: Approximately 10 V → System voltage**

**Q: Is the check result normal?**

**YES : .** Go to Step 8.

**NO : .** Go to Step 6.

**STEP 6. Connector check: A-114 engine-CVT-ECU connector.**



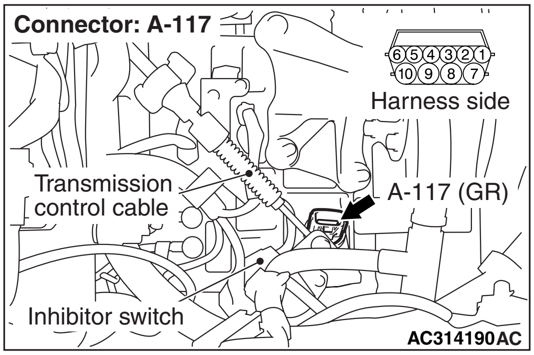

Check for the contact with terminals.

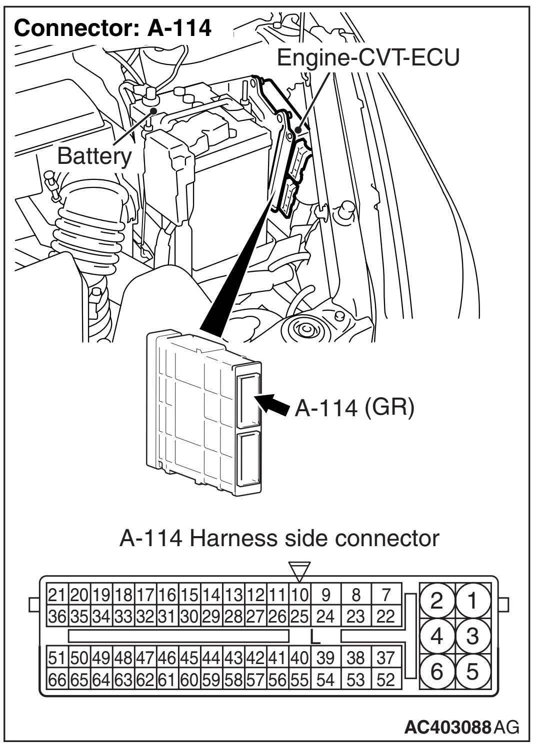
**Q: Is the check result normal?**

**YES :** Go to Step 7.

**NO :** Repair the defective connector.

### STEP 7. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.4 and engine-CVT-ECU connector A-114 terminal No.3.




Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

### STEP 8. M.U.T.-III actuator test

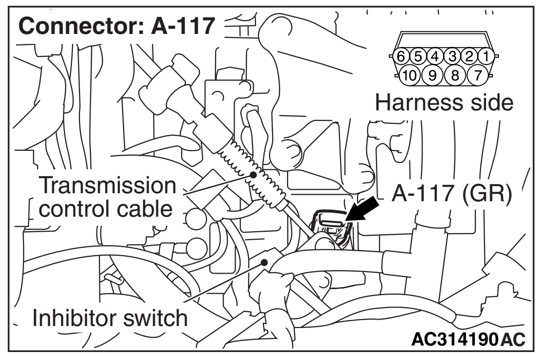
Item 04: Clutch pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

### STEP 9. Connector check: A-117 CVT control solenoid valve assembly connector.

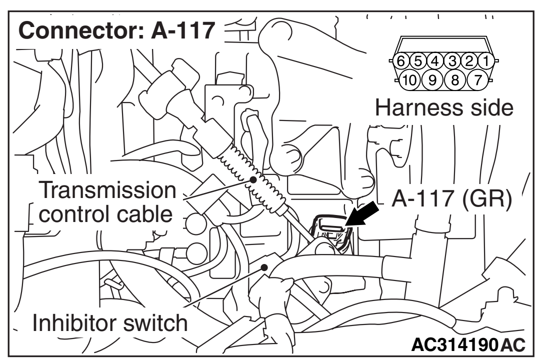



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 10.
**NO :** Repair the defective connector.

### STEP 10. Measure the resistance at CVT control solenoid valve assembly connector A-117.




Disconnect the connector, and measure the resistance between terminal 4 and 9 at the solenoid valve side.

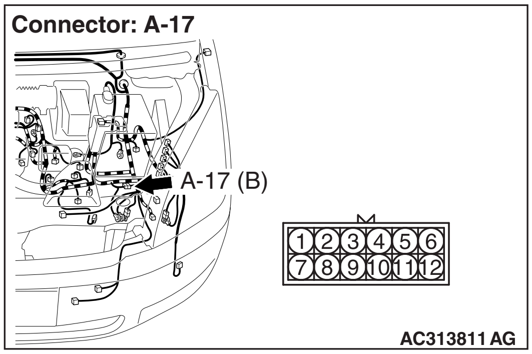
**OK: 2.9 – 3.5 Ω (CVT fluid temperature at 20°C)**

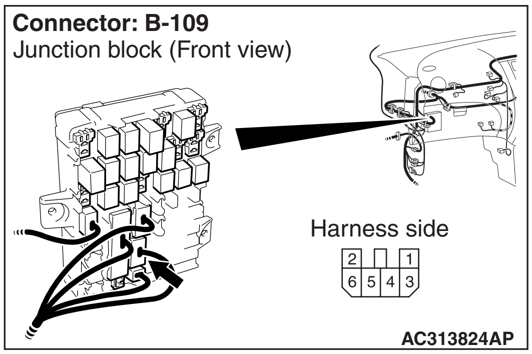
**Q: Is the check result normal?**

**YES :** Go to Step 11.
**NO :** Check the solenoid valve harness.

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### STEP 11. Connectors check: A-17 intermediate connector, B-109 J/B connector.



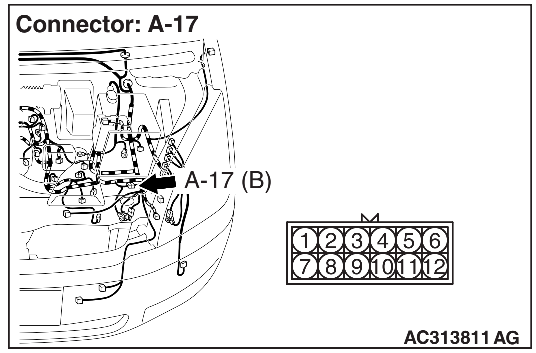

Check for the contact with terminals.

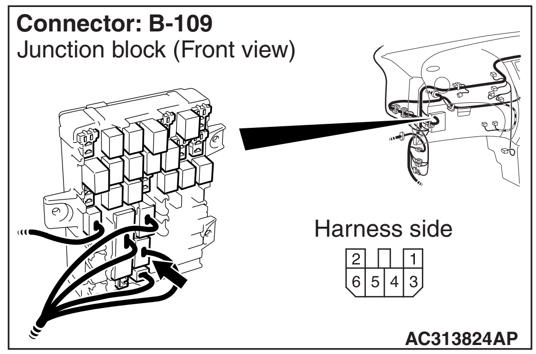
**Q: Is the check result normal?**

**YES :** Go to Step 12.

**NO :** Repair the defective connector.

### STEP 12. Check the harness between CVT control solenoid valve assembly connector A-117 terminal No.9 and J/B connector B-109 terminal No.5.




Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO :** Repair the wiring harness.

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**Code No.42 Fail System of Shift System**

## OPERATION

The engine-CVT-ECU calculates optimum gear ratio by using signals from sensors and switches, and controls the shift control solenoid valve.

## DIAGNOSIS CODE SET CONDITIONS

Code No.42 will be set if actual primary speed (primary speed sensor output) remains 7,000 r/min or more for 0.3 second.

## PROBABLE CAUSES

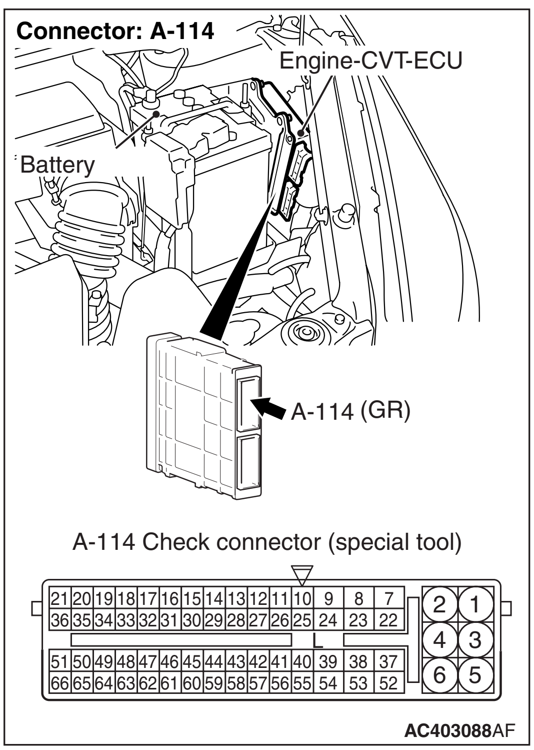
- Malfunction of the engine-CVT-ECU
- Malfunction of the valve body assembly

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III diagnosis code

**Q: Is any code other than No.42, 44, 45, 46, 47, 48 and 57 set?**
**YES :** Check for the relevant code(s).
**NO :** Go to Step 2.

### STEP 2. Measure the output wave pattern of the primary speed sensor at engine-CVT-ECU connector A-114 (using an oscilloscope).




(1) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(2) Shift the selector lever to the D range.
(3) Accelerate the vehicle to approximately 50 km/h.
(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-114 terminal No.43 and earth.

**OK: A wave pattern such as the one shown on P.23A-128 (Check Procedure Using an Oscilloscope) should be output, and the maximum value should be 4.8 V or more and the minimum value should be 0.6 V or less. There should be no noise in the output wave pattern.**

**Q: Is the check result normal?**
**YES :** Go to Step 3.
**NO :** Remove the primary speed sensor. Then, remove the foreign materials or bits of metal on the tip. If there is no foreign materials or bits of metal, replace the primary speed sensor.

### STEP 3. M.U.T.-III actuator test

Item 02: Shift control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**
**YES :** Go to Step 4.
**NO :** Replace the valve body assembly, and then go to Step 6.

### STEP 4. Hydraulic pressure test

Measure the primary pressure at the drive position (D, Ds, L).(Refer to P.23A-140).

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**
**YES :** Go to Step 5.
**NO :** Replace the valve body assembly, and then go to Step 6.

### STEP 5. Valve body assembly disassembly, cleaning and assembly

Check the bolts for looseness and the O-ring, solenoid valve and valve body for damage.(Refer to GROUP 23B, Valve body P.23B-36 ).

**Q: Is the check result normal?**
**YES :** Go to Step 6.
**NO :** Replace the valve body assembly, and then go to Step 6.

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**STEP 6. Test-drive the vehicle, and check whether the diagnosis code is reset.**

**Q: Is the diagnosis code set?**
**YES :** Replace the engine-CVT-ECU.
**NO :** The inspection is complete.

### Code No.44, 45 Fail System of Damper Clutch System

## OPERATION

The engine-CVT-ECU controls whether the damper clutch (incorporated in torque converter) is engaged or disengaged by using signals from sensors and switches.

## DIAGNOSIS CODE SET CONDITIONS

- Code No.44 will be set if the damper clutch slip remains 5 r/min or less for 5 seconds while the vehicle is driven with the damper clutch disengaged (throttle opening is 15% or more and secondary speed is 250 r/min or more).
- Code No.45 will be set if the damper clutch control solenoid duty ratio is 100% for 30 seconds with the damper clutch engaged.

## PROBABLE CAUSES

- Malfunction of damper clutch control solenoid valve
- Malfunction of the valve body assembly
- Malfunction of the torque converter

## DIAGNOSIS PROCEDURE

**STEP 1. M.U.T.-III diagnosis code**

**Q: Is any code other than No.42, 44, 45, 46, 47, 48 and 57 set?**
**YES :** Check for the relevant code(s).
**NO :** Go to Step 2.

**STEP 2. M.U.T.-III actuator test**
Item 03: Damper clutch control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**
**YES :** Go to Step 3.
**NO :** Refer to code No.33, 37: Damper clutch control solenoid valve system P.23A-86.

**STEP 3. Disassemble, clean and assemble the valve body assembly.**
Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**
**YES :** Replace the torque converter.
**NO :** Replace the valve body assembly.

### Code No.46, 48 Fail System of Clutch System

## OPERATION

The engine-CVT-ECU controls the clutch pressure control solenoid valve by using signals from the sensor and switches to apply fluid pressure to the forward clutch or the reverse brake.

## DIAGNOSIS CODE SET CONDITIONS

- If both of the primary and secondary speeds are 0 r/min for 30 seconds when the selector lever is at D range and the engine and turbine speeds are 500 r/min or more, code No.46 will be set.
- If turbine speed divided by primary speed is 0.8 or less, or 1.25 or more for 13 seconds when the selector lever is at D range and the engine speed is 500 r/min or more, code No.48 will be set.

## PROBABLE CAUSES

- Malfunction of the line pressure sensor
- Malfunction of the line pressure control solenoid valve
- Malfunction of the clutch pressure control solenoid valve
- Malfunction of the engine-CVT-ECU
- Malfunction of the valve body assembly
- Malfunction of the forward clutch
- Malfunction of the reverse brake

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## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III diagnosis code

**Q: Is any code other than No.42, 44, 45, 46, 47, 48 and 57 set?**

**YES :** Check for the relevant code(s).
**NO :** Go to Step 2.

### STEP 2. M.U.T.-III data list

Item 09: Line pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Replace the CVT assembly.

### STEP 3. M.U.T.-III actuator test

Item 01: Line pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Replace the CVT assembly.

### STEP 4. M.U.T.-III actuator test

Item 04: Clutch pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Refer to code No.34, 38: Clutch pressure control solenoid valve system P.23A-90.

### STEP 5. Hydraulic pressure test.

Measure the following fluid pressures (Refer to P.23A-140).

a. Forward clutch pressure
b. Reverse brake pressure
c. Line pressure

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**

**YES :** Go to Step 10.
**NO <"NG" for all items> :** Replace the CVT assembly.
**NO <"NG" for both "a" and "b"> :** Go to Step 6.
**NO <"NG" for either "a" or "b"> :** Go to Step 8.

### STEP 6. Replace the engine-CVT-ECU and then recheck the diagnosis code.

(1) Replace the engine-CVT-ECU.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is diagnosis code set?**

**YES :** Go to Step 7.
**NO :** The inspection is complete.

### STEP 7. Disassemble, clean and assemble the valve body assembly.

Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**

**YES :** The inspection is complete.
**NO :** Replace the valve body assembly.

### STEP 8. Check the forward clutch system and reverse brake system.

(1) Remove the transmission assembly, the valve body cover and the valve body assembly.
(2) Blow air into the forward clutch and the reverse brake oil holes on the transmission case. Check that the piston moves and the air pressure is maintained.

**Q: Is the check result normal?**

**YES :** Go to Step 7.
**NO :** Go to Step 9.

### STEP 9. Check the forward clutch and reverse brake.

Check the facing for seizure and the piston seal ring for damage and interference with the retainer (Refer to GROUP 23B - Forward Clutch P.23B-31 or Reverse Brake P.23B-34).

**Q: Is the check result normal?**

**YES :** The inspection is complete.
**NO :** Repair or replace the forward clutch and the reverse brake.

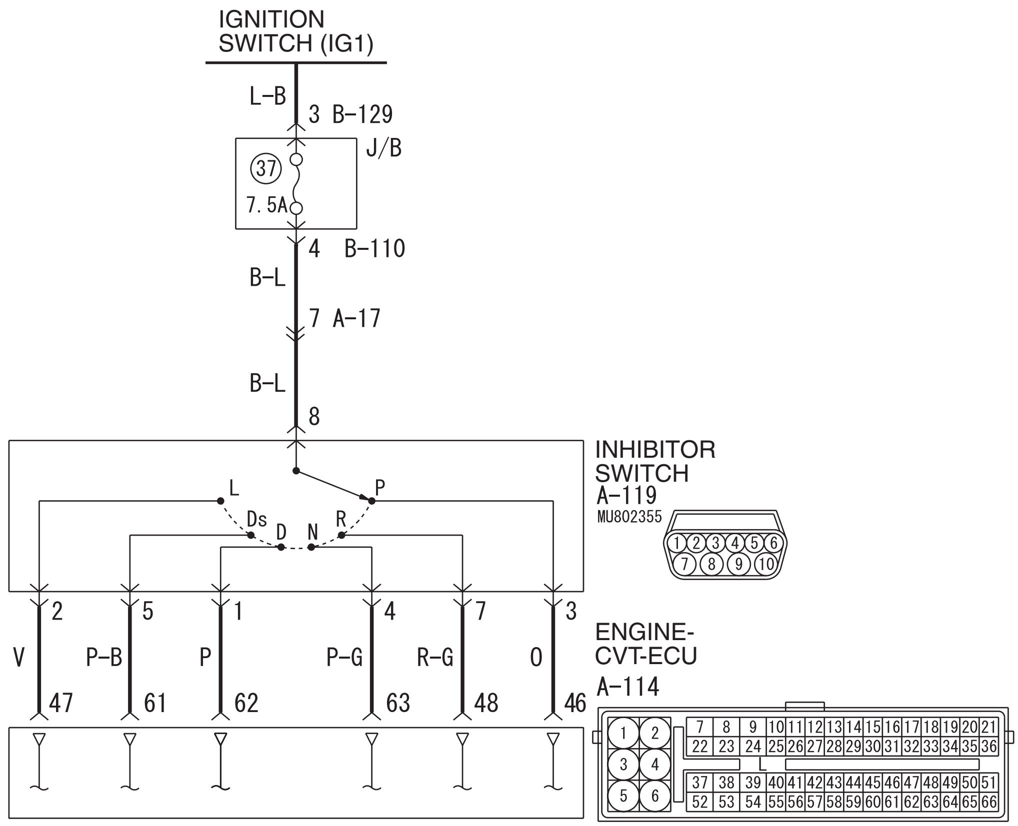
### STEP 10. Recheck the diagnosis code.

**Q: Is code No.46 or 48 set?**

**YES :** Replace the CVT assembly.
**NO :** The inspection is complete.

## Code No.51, 52 Inhibitor Switch System

**Inhibitor Switch System Circuit**




Wire colour code
B : Black LG : Light green G : Green L : Blue W : White Y : Yellow SB : Sky blue
BR : Brown O : Orange GR : Gray R : Red P : Pink V : Violet

AC405506AC

## OPERATION

The inhibitor switch detects the selector lever position (P, R, N, D, Ds, L), and sends the information to the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

- If the inhibitor switch has not been sending any signal for at least 30 seconds, an open circuit may be present and dianosis code No.51 will be set.
- If the inhibitor switch has been sending multiple signals for at least 30 seconds, the circuit may be open and diagnosis code No.52 will be set.

## PROBABLE CAUSES

- Malfunction of inhibitor switch
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

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### STEP 1. M.U.T.-III data list

Item 26: Inhibitor switch (Refer to data list reference table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Go to Step 2.

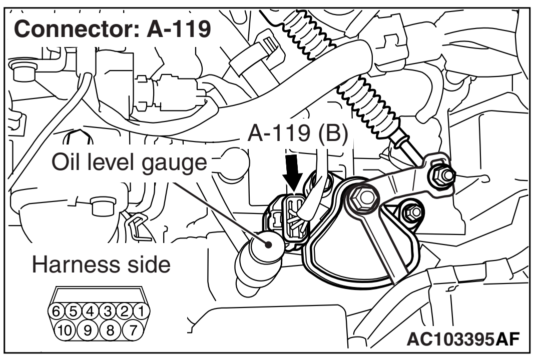
### STEP 2. Check the inhibitor switch.

Refer to P.23A-135.

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Replace the inhibitor switch.

### STEP 3. Connector check: A-119 inhibitor switch connector.

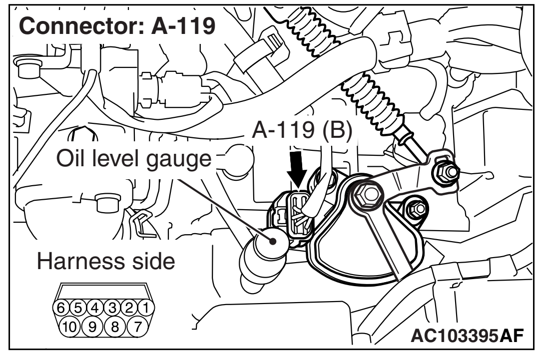



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Repair the defective connector.

### STEP 4. Measure the voltage at inhibitor switch connector A-119.



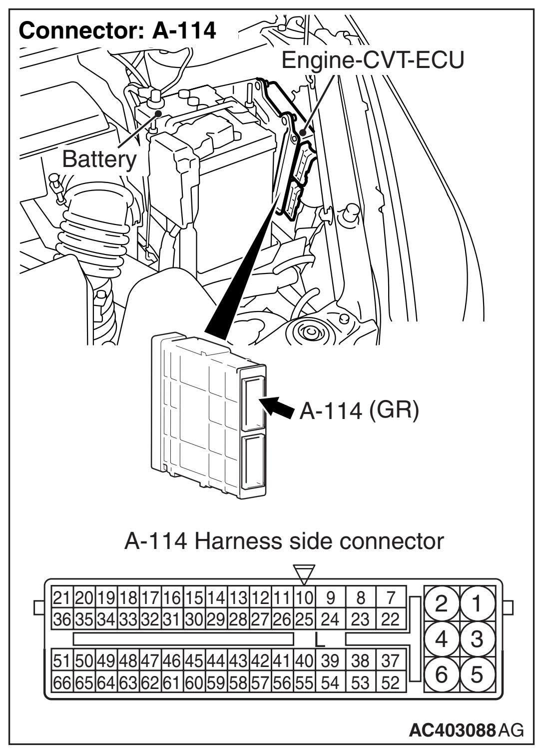

(1) Disconnect the connector, and measure the voltage between terminal 8 and earth at the wiring harness side.
(2) Turn the ignition switch to the ON position.

**OK: System voltage**

**Q: Is the check result normal?**

**YES : .** Go to Step 5.
**NO : .** Go to Step 8.

### STEP 5. Connector check: A-114 engine-CVT-ECU connector.

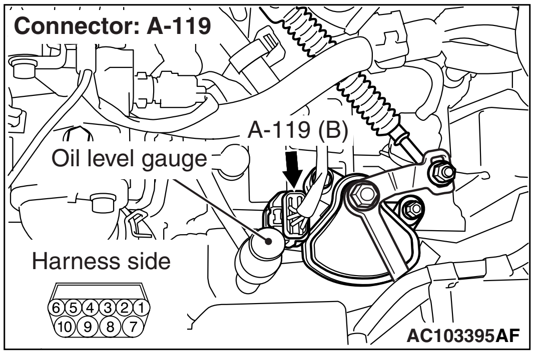


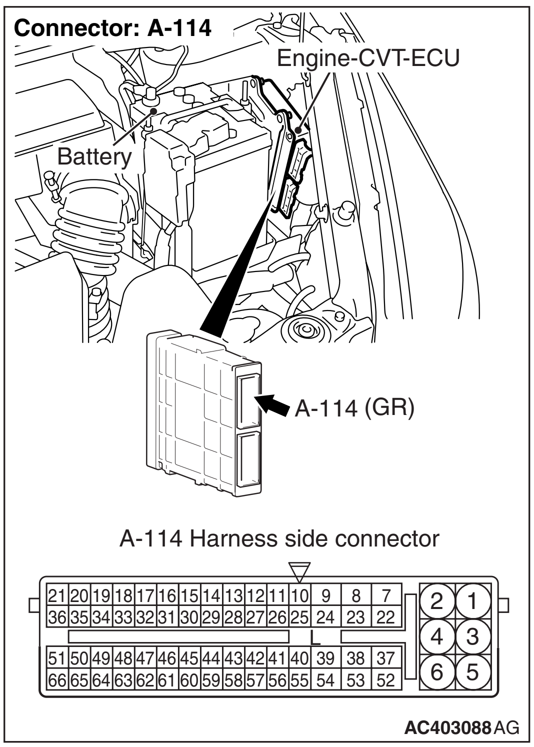

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES : .** Go to Step 6.
**NO : .** Repair the defective connector.

**STEP 6. Check the harness between inhibitor switch connector A-119 terminal No.3 (P), 7 (R), 4 (N), 1 (D), 5 (Ds), 2 (L) and engine-CVT-ECU connector A-114 terminal No.46 (P), 48 (R), 63 (N), 62 (D), 61 (Ds), 47 (L).**




Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 7.

**NO :** Repair the wiring harness.

**STEP 7. M.U.T.-III data list**

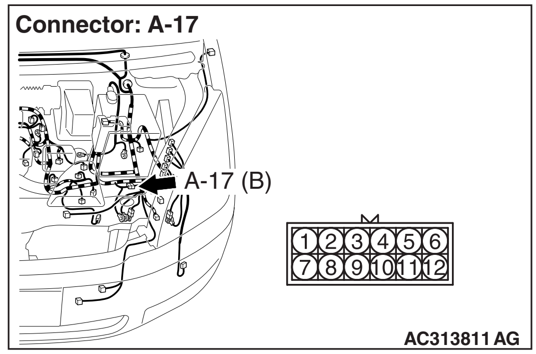
Item 26: Inhibitor switch (Refer to data list reference table P.23A-123).

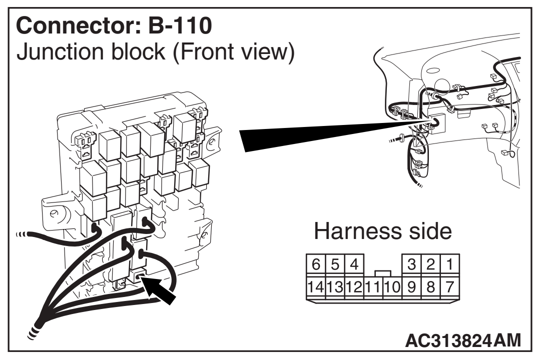
**Q: Is the check result normal?**

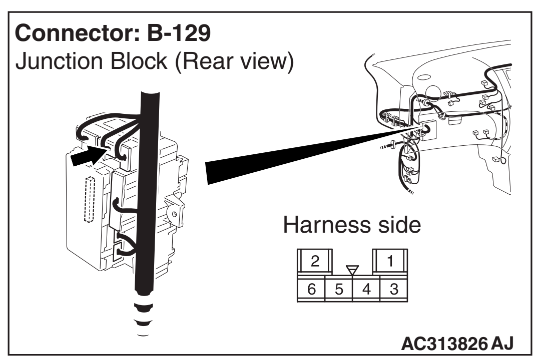
**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Replace the engine-CVT-ECU.

**STEP 8. Connectors check: A-17 intermediate connector, B-110, B-129 J/B connector.**




Check for the contact with terminals.

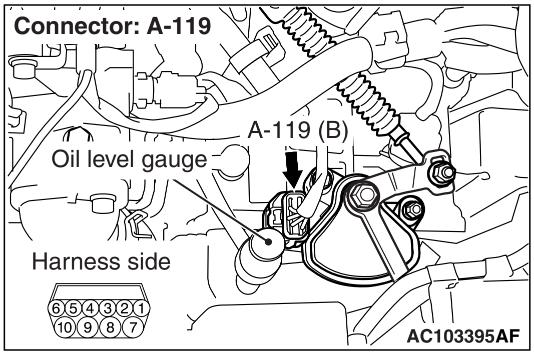
**Q: Is the check result normal?**

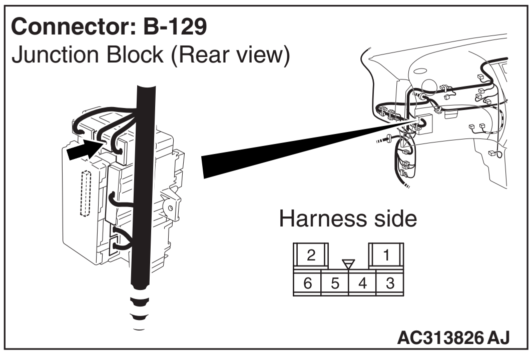
**YES :** Go to Step 9.

**NO :** Repair the defective connector.

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**STEP 9. Check the harness between inhibitor switch connector A-119 terminal No.8 and J/B connector B-129 terminal No.3.**




Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**

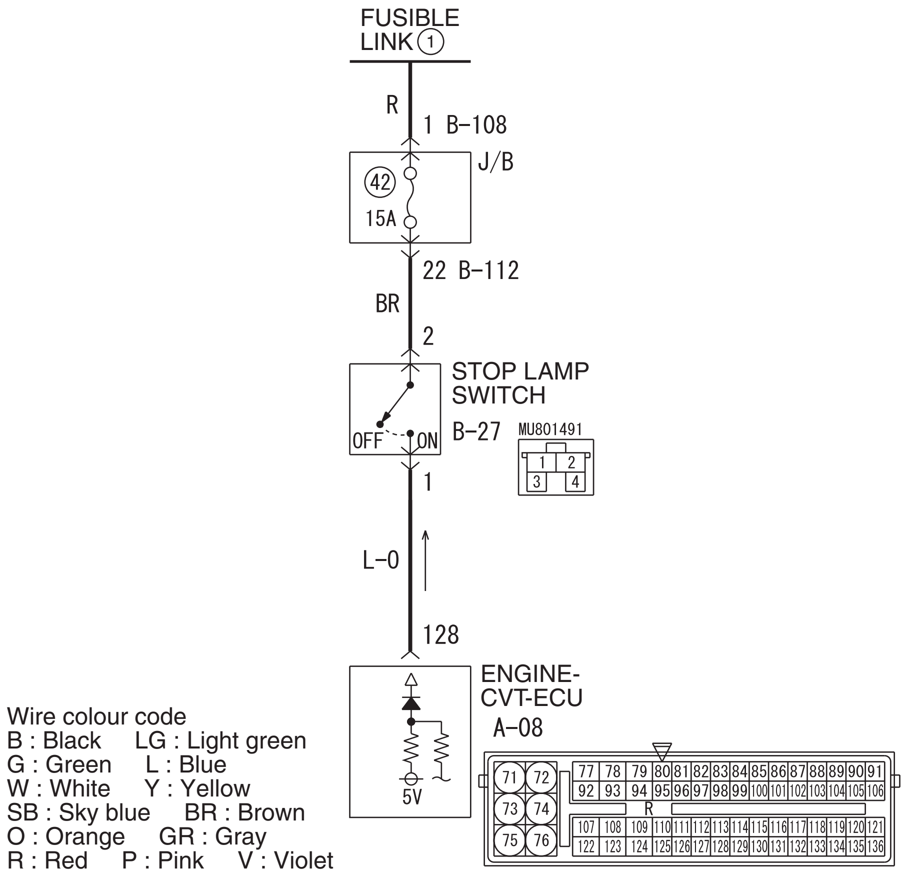
**YES :** Go to Step 7.

**NO :** Repair the wiring harness.

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## Code No.53, 54 Stop Lamp Switch System

Stop Lamp Switch System Circuit




AC405395

## OPERATION

The stop lamp switch judges whether the brake pedal is depressed or released, and sends the information to the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

- If the stop lamp switch remains on for five minutes when the vehicle is being driven (secondary speed is 750 r/min or more), code No.53 will be set.
- If the stop lamp switch is not turned on although the secondary speed rises to 2,500 r/min or more and then reduces to 250 r/min or less 15 cycles, code No.54 will be set.

## PROBABLE CAUSES

- Malfunction of brake pedal
- Malfunction of stop lamp switch
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

**STEP 1. Check that the stop lamps illuminate and extinguish normally.**

The stop lamps should illuminate when the brake pedal is depressed, and extinguish when released.

**Q: Is the check result normal?**

**YES :** Go to Step 7.
**NO :** Go to Step 2.

**STEP 2. Check the brake pedal height.**

Refer to GROUP 35A – On-vehicle Service, Brake Pedal Check and Adjustment (Refer to P.35A-7).

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Adjust the brake pedal height.

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**STEP 3. Check the stop lamp switch.**

Refer to GROUP 35A – Brake Pedal and Stop Lamp Switch Continuity Check (Refer to P.35A-22).

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Replace the stop lamp switch.

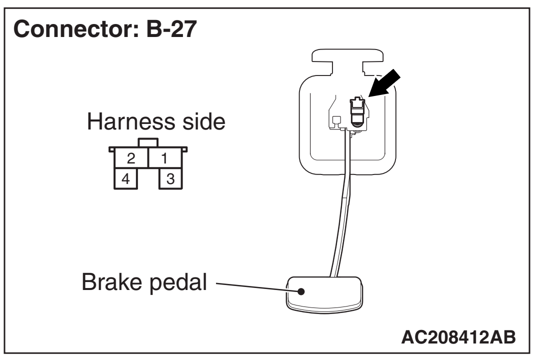
**STEP 4. M.U.T.-III data list**

Item 33: Stop lamp switch (Refer to data list reference table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Go to Step 5.

**STEP 5. Connector check: B-27 stop lamp switch connector.**

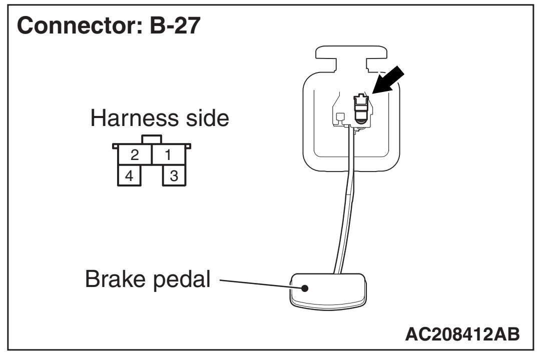



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 6.
**NO :** Repair the defective connector.

**STEP 6. Measure the voltage at stop lamp switch connector B-27.**




Disconnect the connector, and measure the voltage between terminal No.2 and earth at the harness side.

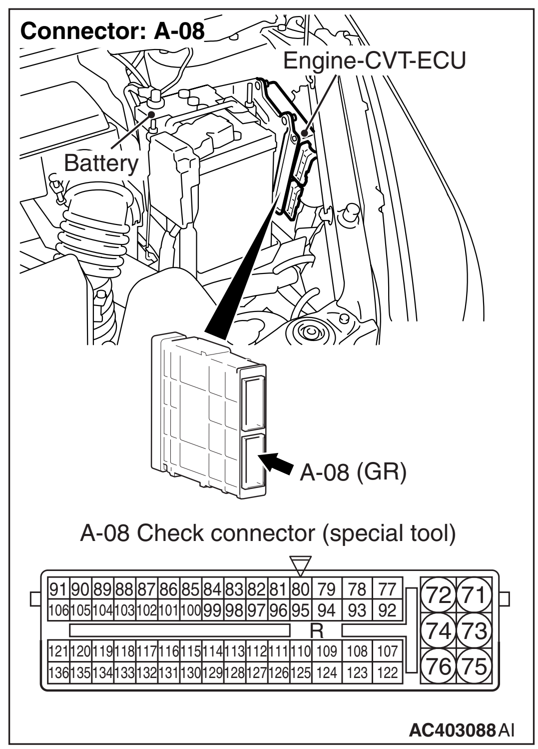
**OK: System voltage**

**Q: Is the check result normal?**

**YES :** Go to Step 7.
**NO :** Go to Step 12.

**STEP 7. Measure the voltage at engine-CVT-ECU connector A-08.**

(1) Connect stop lamp switch connector B-27.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

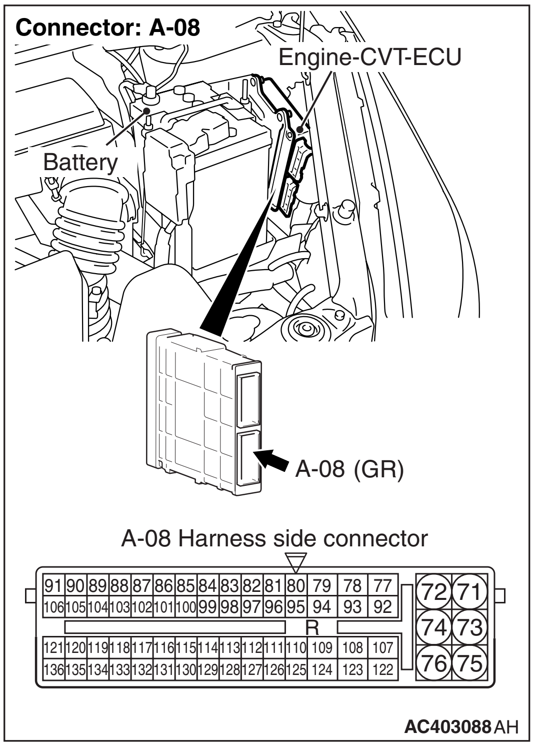
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(3) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-08 terminal No.128 and earth.

**OK:**
**Brake pedal depressed: System voltage**
**Brake pedal not depressed: 1 V or less**

**Q: Is the check result normal?**
**YES :** Go to Step 8.
**NO :** Go to Step 10.

### STEP 8. Connector check: A-08 engine-CVT-ECU connector.




Check for the contact with terminals.

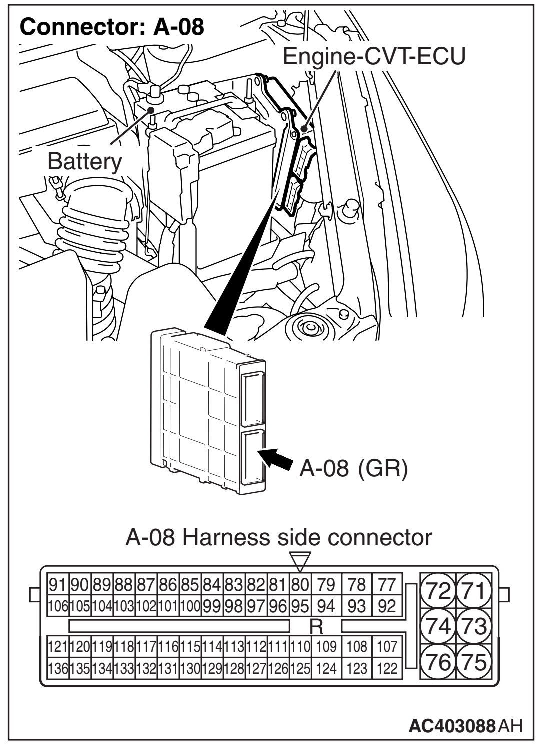
**Q: Is the check result normal?**
**YES :** Go to Step 9.
**NO :** Repair the defective connector.

### STEP 9. M.U.T.-III data list

Item 33: Stop lamp switch (Refer to data list reference table P.23A-123).

**Q: Is the check result normal?**
**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

### STEP 10. Connector check: A-08 engine-CVT-ECU connector.

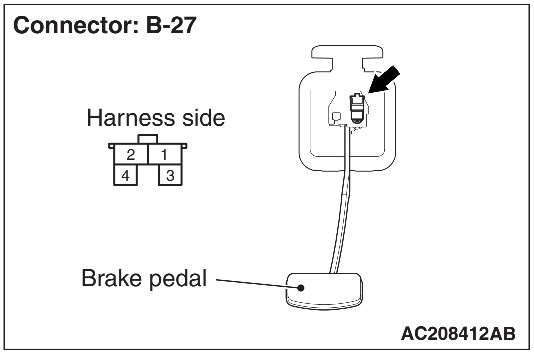


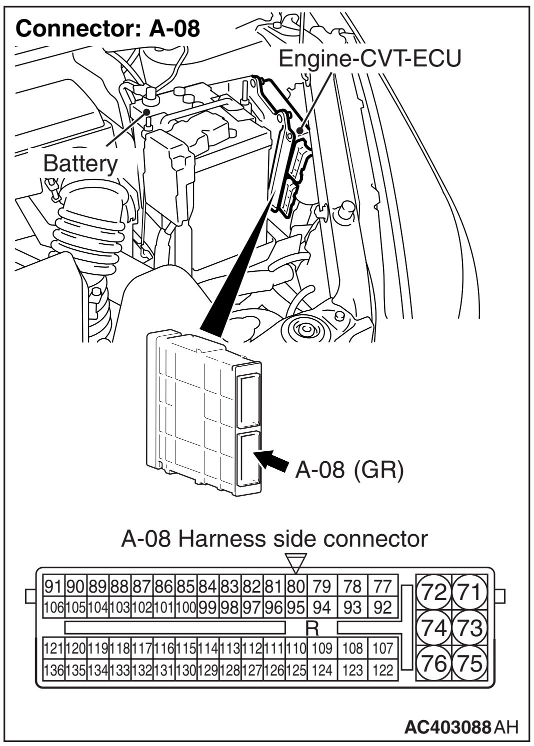

Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 11.
**NO :** Repair the defective connector.

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### STEP 11. Check the harness between stop lamp switch connector B-27 terminal No.1 and engine-CVT-ECU connector A-08 terminal No.128.

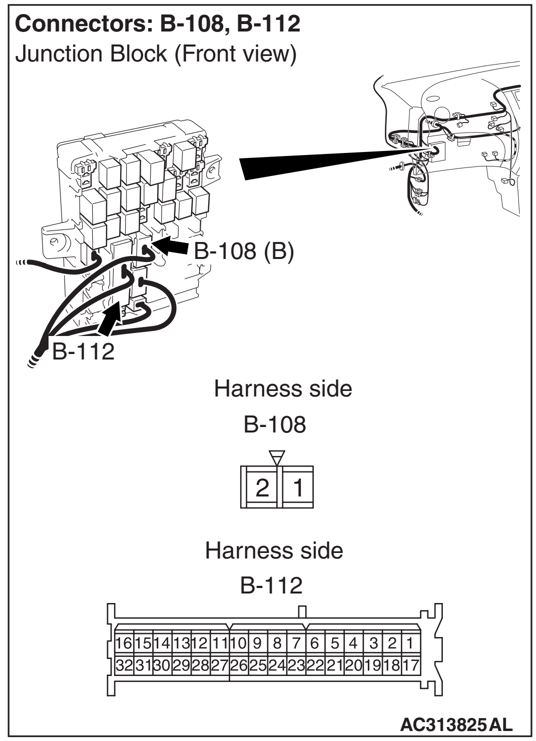



Check the output line for short-circuited or open circuit.

**Q: Is the check result normal?**
- **YES :** Go to Step 9.
- **NO :** Repair the wiring harness.

### STEP 12. Connectors check: B-108, B-112 J/B connector.

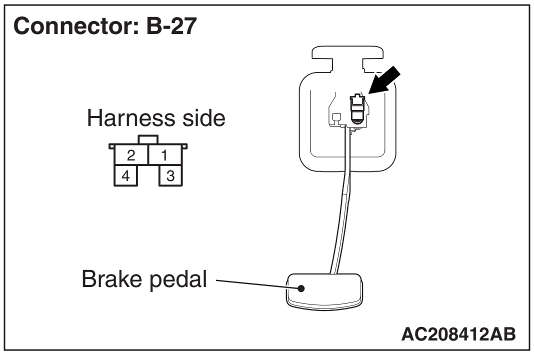


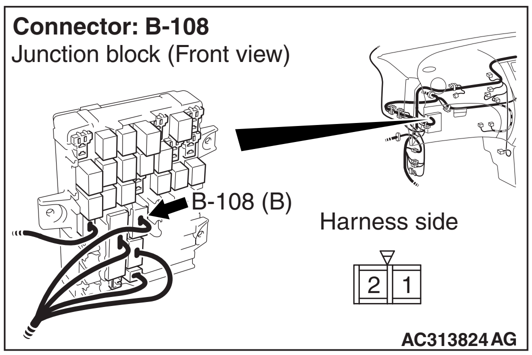

Check for the contact with terminals.

**Q: Is the check result normal?**
- **YES :** Go to Step 13.
- **NO :** Repair the defective connector.

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**STEP 13. Check the harness between stop lamp switch connector B-27 terminal No.2 and J/B connector B-108 terminal No.1.**



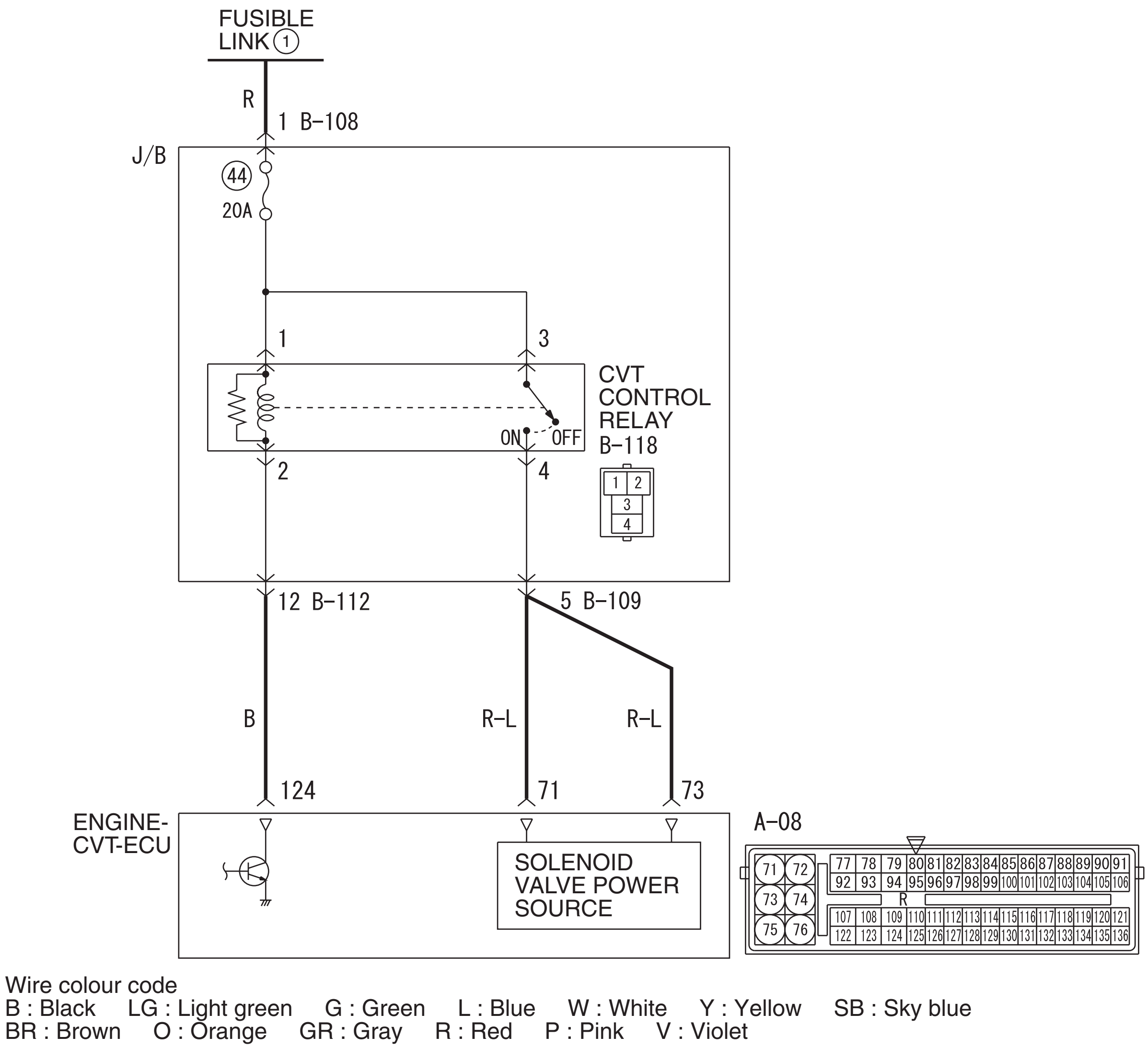

Check the power supply line for short-circuited or open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 9.
**NO :** Repair the wiring harness.

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## Code No.56 CVT Control Relay System

CVT Control Relay System Circuit




## OPERATION

If a fail-safe operation is activated, the CVT control relay shuts off the power supply to the solenoid valve in accordance with the signal from the engine-CVT-ECU.

## DIAGNOSIS CODE SET CONDITIONS

Code No.56 will be set if the relay voltage is less than 7 V although the battery voltage is 9 V or more.

## PROBABLE CAUSES

- Malfunction of CVT control relay
- Damaged harness wires and connectors
- Malfunction of the engine-CVT-ECU

## DIAGNOSIS PROCEDURE

### STEP 1. M.U.T.-III data list

Item 25: Relay voltage (Refer to data list reference table P.23A-123).

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).

**NO :** Go to Step 2.

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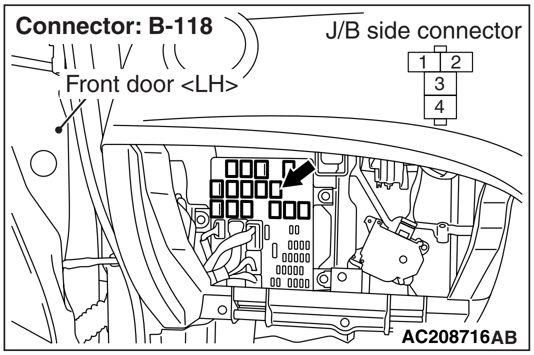
### STEP 2. Check the CVT control relay.

Refer to P.23A-137.

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Replace the CVT control relay.

### STEP 3. Connector check: B-118 CVT control relay connector.

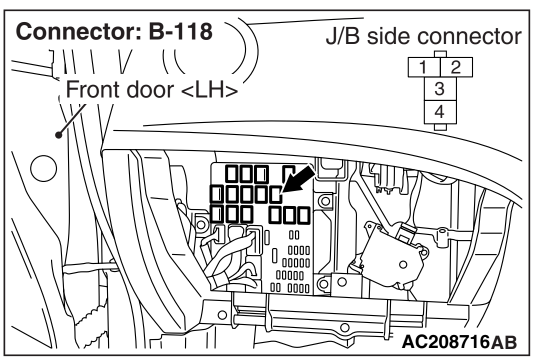



Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Repair the defective connector.

### STEP 4. Measure the voltage at CVT control relay connector B-118.




Disconnect the CVT control relay, and measure the voltage between terminal No.1, 3 and earth at the J/B side.

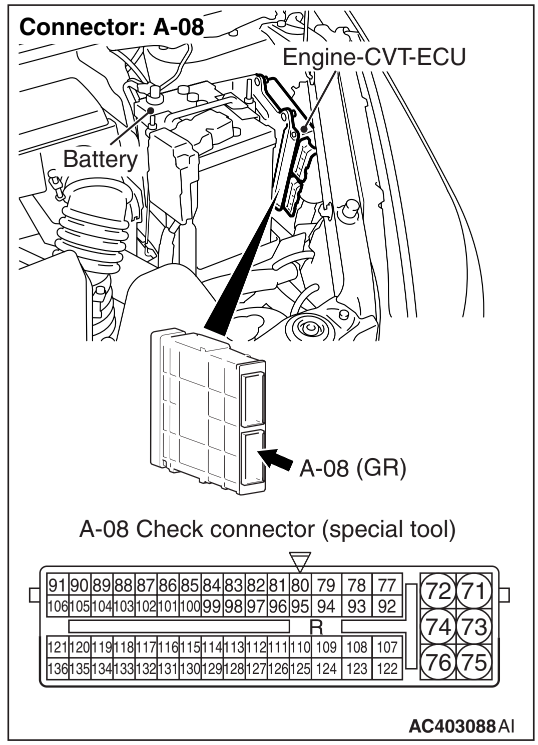
**OK: System voltage**

**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Go to Step 13.

### STEP 5. Measure the voltage at engine-CVT-ECU connector A-08.

(1) Install the CVT control relay.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).
(3) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-08 terminal No.124 and earth.

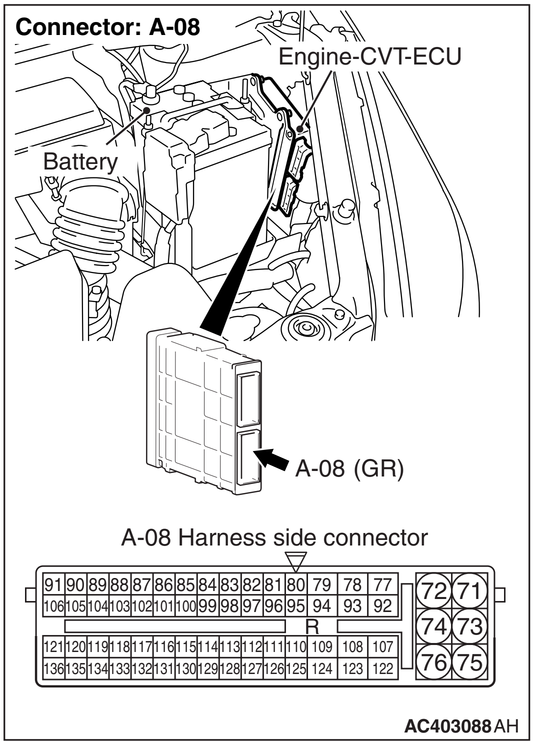
**OK:**
**Turn the ignition switch to the OFF position: System voltage**
**Turn the ignition switch to the ON position: 1 V or less**

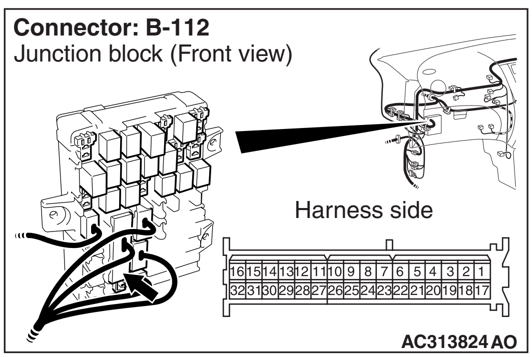
**Q: Is the check result normal?**

**YES :** Go to Step 9.
**NO :** Go to Step 6.

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### STEP 6. Connectors check: A-08 engine-CVT-ECU, B-112 J/B connector.



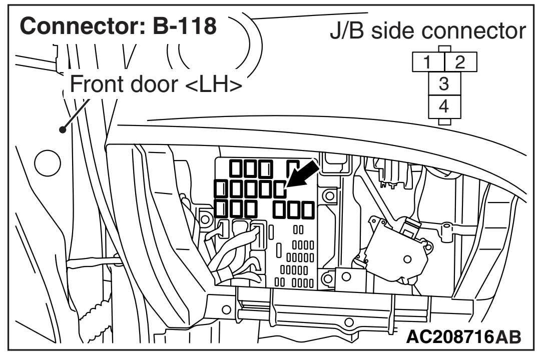



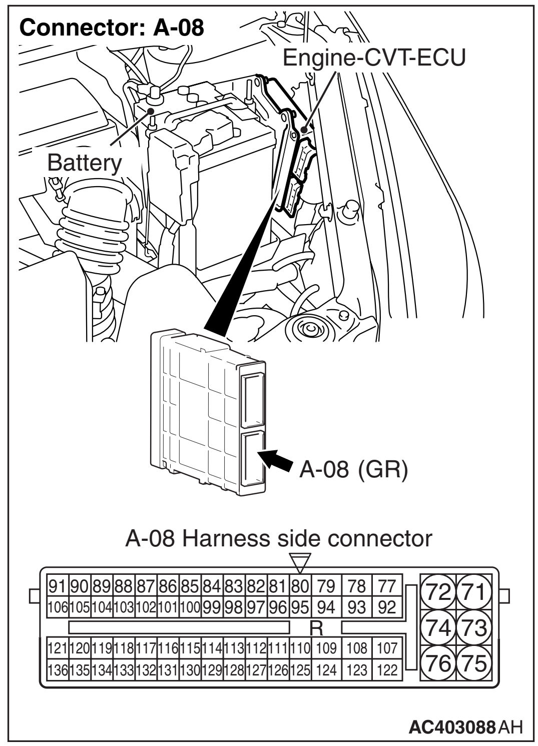

Check for the contact with terminals.

**Q: Is the check result normal?**

**YES :** Go to Step 7.
**NO :** Repair the defective connector.

### STEP 7. Check the wiring harness between CVT control relay connector B-118 terminal No.2 and engine-CVT-ECU connector A-08 terminal No.124.




Check the output line for short or open circuit.

**Q: Is the check result normal?**

**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

### STEP 8. M.U.T.-III data list

Item 25: Relay voltage (Refer to data list reference table P.23A-123).

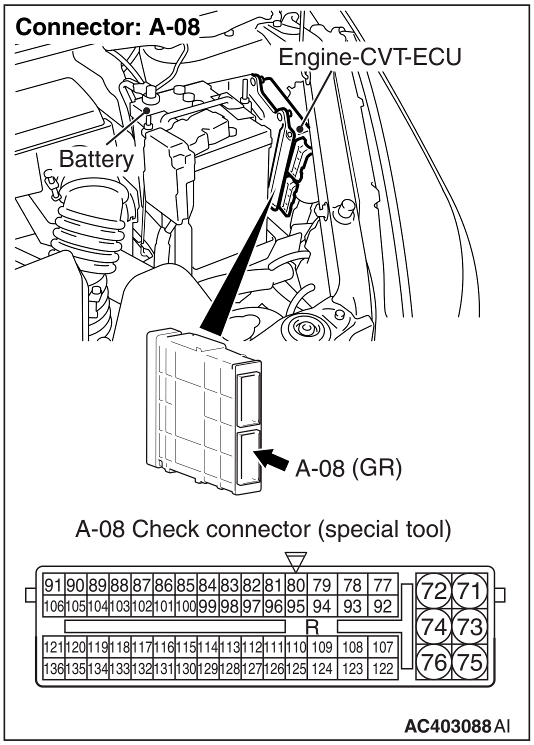
**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Replace the engine-CVT-ECU.

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**STEP 9. Measure the voltage at engine-CVT-ECU connector A-08.**

(1) Install the CVT control relay.




(2) Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987).

(3) Turn the ignition switch to the ON position.

(4) Use the special tool Check connector to measure the voltage between engine-CVT-ECU connector A-08 terminal Nos.73, 71 and earth.

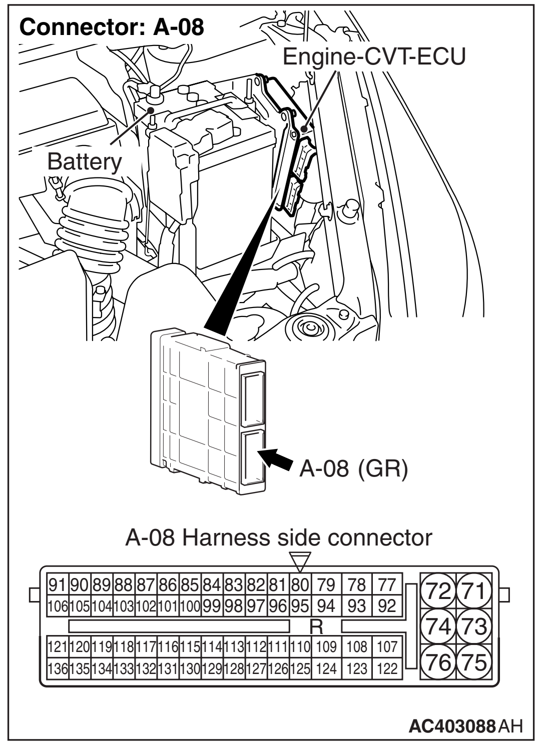
**OK: System voltage**

**Q: Is the check result normal?**

**YES : .** Go to Step 10.

**NO :** Go to Step 11.

**STEP 10. Connector check: A-08 engine-CVT-ECU connector.**




Check for the contact with terminals.

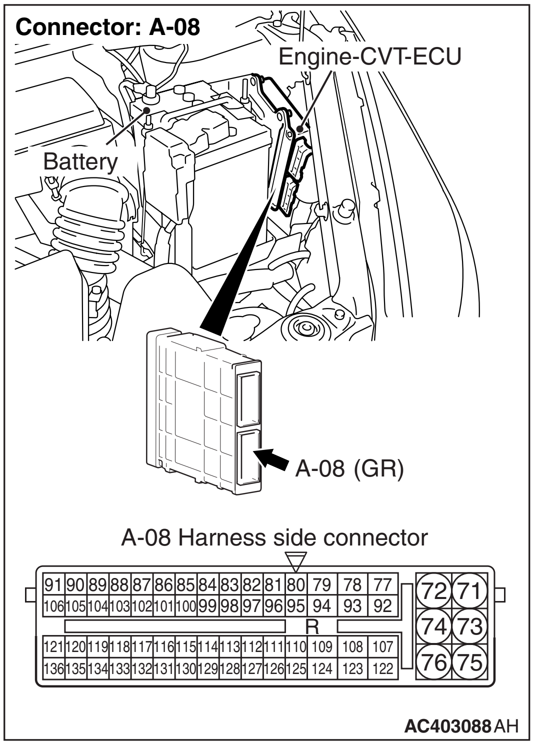
**Q: Is the check result normal?**

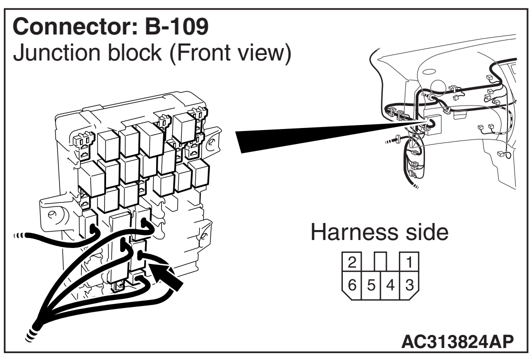
**YES :** Go to Step 8.

**NO :** Repair the defective connector.

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### STEP 11. Connectors check: A-08 engine-CVT-ECU connector, B-109 J/B connector.

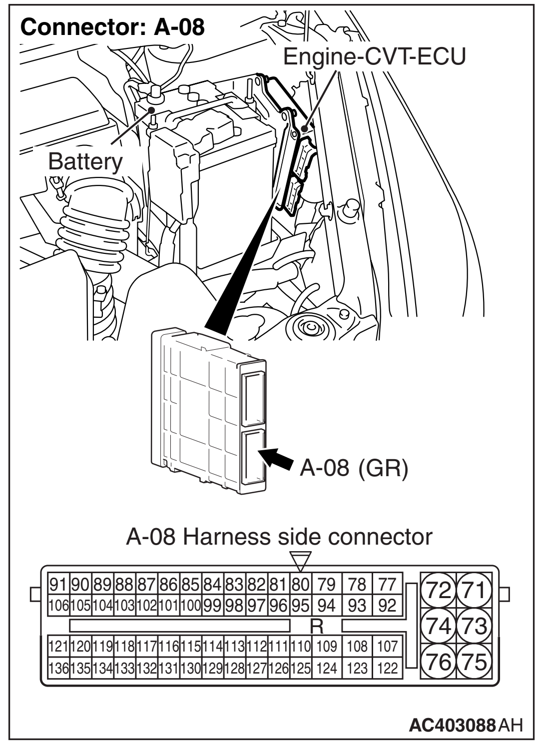


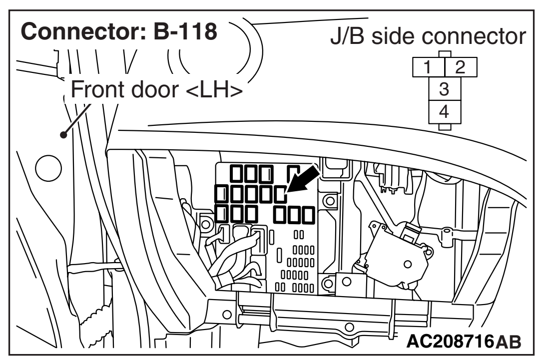




Check for the contact with terminals.

**Q: Is the check result normal?**
- **YES :** Go to Step 12.
- **NO :** Repair the defective connector.

### STEP 12. Check the harness between engine-CVT-ECU connector A-08 terminal No.73, 71 and CVT control relay connector B-118 terminal No.4.



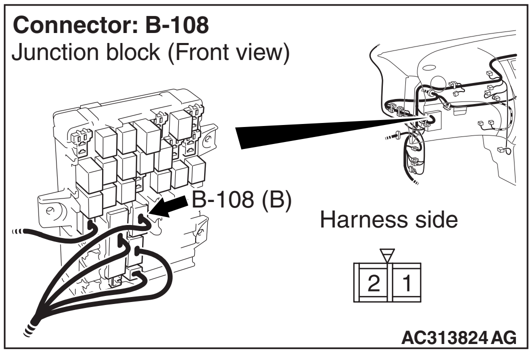




Check the power supply line for short or open circuit.

**Q: Is the check result normal?**
- **YES :** Go to Step 8.
- **NO :** Repair the wiring harness.

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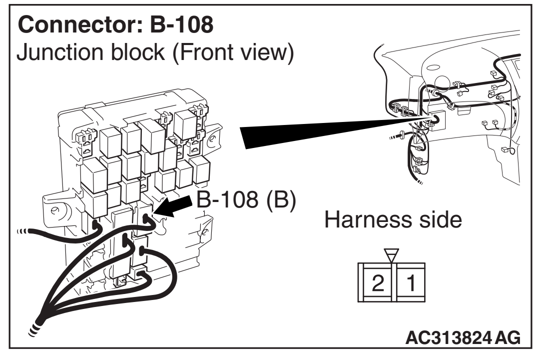
### STEP 13. Connector check: B-108 J/B connector.

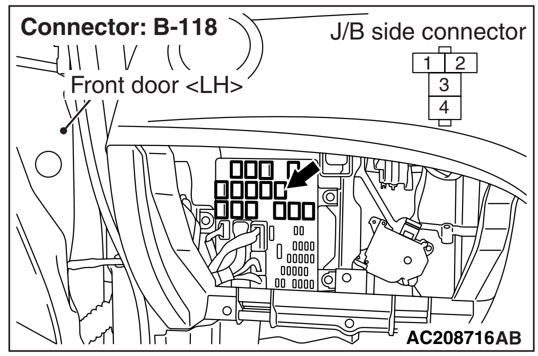



Check for the contact with terminals.

**Q: Is the check result normal?**
**YES :** Go to Step 14.
**NO :** Repair the defective connector.

### STEP 14. Check the harness between J/B connector B-108 terminal No.1 and CVT control relay connector B-118 terminal No.1, 3.




Check the power supply line for short or open circuit.

**Q: Is the check result normal?**
**YES :** Go to Step 8.
**NO :** Repair the wiring harness.

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## Code No.59 Steel belt system

### OPERATION

Based on the rotational speed difference between the primary speed sensor and the secondary speed sensor, the slip amount of the steel belt is calculated.

### DIAGNOSIS CODE SET CONDITIONS

When the rotational speed difference between the primary pulley and the secondary pulley in the CVT exceeds the limit value (gear ratio: 2.319), diagnosis code No.59 is set.

#### PROBABLE CAUSES

- Malfunction of CVT assembly

### DIAGNOSIS PROCEDURE

#### STEP 1. M.U.T.-III diagnosis code.

**Q: Is diagnosis code set?**

**YES :** Check for the relevant code(s).
**NO :** Go to Step 2.

#### STEP 2. M.U.T.-III actuator test

Item 01: Line pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Repair or replace the line pressure control solenoid valve system.

#### STEP 3. M.U.T.-III data list

Item 09: Line pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Repair or replace the line pressure sensor system.

#### STEP 4. M.U.T.-III data list

- Item 03: Primary speed sensor (Refer to Data List Table P.23A-123).
- Item 04: Secondary speed sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Repair or replace the primary speed sensor system or secondary speed sensor system.

#### STEP 5. M.U.T.-III data list

- Item 09: Line pressure sensor (Refer to Data List Table P.23A-123).
- Item 11: Primary pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 6.
**NO :** Repair or replace the primary pressure sensor system.

#### STEP 6. Check whether the diagnosis code is reset.

(1) Erase the diagnosis code.
(2) Test drive the vehicle.
(3) Check if the diagnosis code is set.

**Q: Is the diagnosis code set?**

**YES :** The inspection is complete.
**NO :** Replace the CVT assembly.

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## Code No.57, 71, 72 Fail System of Line Pressure System

### OPERATION

The engine-CVT-ECU controls the line pressure by using signals from sensors and switches.

### DIAGNOSIS CODE SET CONDITIONS

- Code No.57 will be set if the engine output torque exceeds the CVT input permissible torque which is calculated according to the line pressure.
- Code No.71 will be set if the ECU detects that the line pressure control solenoid valve duty ratio is 90% or more, and the line pressure is 1.2 MPa or more for 5 seconds.
- Code No.72 will be set if the ECU detects that the line pressure control solenoid valve duty ratio is 90% or more, and the line pressure is 2.0 MPa or more for 10 seconds.

### PROBABLE CAUSES

- Malfunction of oil pump (Hydraulic delivery lowered)
- Malfunction of line pressure control solenoid valve
- Malfunction of valve body
- Malfunction of the line pressure sensor
- Malfunction of the engine system
- Malfunction of the shift control solenoid valve
- Malfunction of the primary pressure sensor
- Low transmission fluid level
- Malfunction of the engine-CVT-ECU
- Faulty CVT power train system

### DIAGNOSIS PROCEDURE

**STEP 1. Engine system check**

Refer to GROUP 13A – Troubleshooting, Inspection Chart for Trouble Symptoms P.13A-231.

**Q: Is the check result normal?**

**YES :** Go to Step 2.
**NO :** Check for the relevant trouble symptom.

**STEP 2. M.U.T.-III diagnosis code**

**Q: Is any code other than No.42, 44, 45, 46, 47, 48 and 57 set?**

**YES :** Check for the relevant code(s).
**NO :** Go to Step 3.

**STEP 3. M.U.T.-III data list**

Item 09: Line pressure sensor (Refer to data list reference table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Replace the CVT assembly.

**STEP 4. M.U.T.-III actuator test**

Item 01: Line pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Refer to code No.31: Line pressure control solenoid valve system P.23A-77.

**STEP 5. M.U.T.-III actuator test**

Item 02: Shift control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Intermittent malfunction (Refer to GROUP 00 – How to Cope with Intermittent Malfunction P.00-13).
**NO :** Refer to code No.32, 36: Shift control solenoid valve system P.23A-82.

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## INSPECTION CHART FOR TROUBLE SYMPTOMS

M1231208000129

⚠ CAUTION

**During diagnosis, a diagnosis code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for diagnosis code(s). If diagnosis code(s) are set, erase them all.**

| Trouble symptom | Inspection procedure No. | Reference page |
|---|---|---|
| Communication with M.U.T.-III not possible | 1 | Refer to GROUP 13A, Troubleshooting P.13A-235. |
| Driving not possible (Engine not started) | 2 | P.23A-115 |
| Driving not possible (Vehicle not moved) | 3 | P.23A-115 |
| Fault at vehicle start (Engine stall during shift) | 4 | P.23A-117 |
| Fault at vehicle start (Shift shock N to D, N to R) | 5 | P.23A-117 |
| Fault during driving (Poor acceleration) | 6 | P.23A-119 |
| Fault during driving (Vibration) | 7 | P.23A-120 |
| Fault during driving (Excessive engine brake operated) | 8 | P.23A-121 |
| CVT indicator lamp system | 9 | P.23A-122 |

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# INSPECTION PROCEDURES FOR TROUBLE SYMPTOM

### Inspection Procedure 2: Driving Not Possible (Engine Not Started)

## COMMENTS ON TROUBLE SYMPTOM

If the engine does not start when the selector lever is in "P" or "N" position, the cause is probably a malfunction of inhibitor switch system, transmission control cable or engine system.

## PROBABLE CAUSES

- Malfunction of inhibitor switch
- Malfunction of transmission control cable assembly
- Malfunction of engine system

## DIAGNOSIS PROCEDURE

**STEP 1. M.U.T.-III diagnosis code**

Either of diagnosis codes 51 or 52 is set, inhibitor switch is defective.

**Q: Are diagnosis codes 51 or 52 output?**

**YES :** Refer to diagnosis code 51, 52: Inhibitor switch system P.23A-97.

**NO :** Go to Step 2.

**STEP 2. Transmission control cable check.**

Check the transmission control cable.

**Q: Is the check result normal?**

**YES :** Go to Step 3.

**NO :** Repair or replace the transmission control cable (Refer to P.23A-146).

**STEP 3. Engine system check.**

Refer to GROUP 13A – Troubleshooting, Inspection Chart for Trouble Symptoms P.13A-231.

**Q: Is the check result normal?**

**YES :** The inspection is complete.

**NO :** Check for the relevant trouble symptom.

### Inspection Procedure 3: Driving Not Possible (Vehicle Not Moved)

## COMMENTS ON TROUBLE SYMPTOM

If the vehicle does not move when the selector lever is moved from the N to D, or from N to R with the engine idling, the oil pump or the valve body may be defective.

## PROBABLE CAUSES

- Malfunction of inhibitor switch system
- Malfunction of transmission control cable assembly
- Malfunction of line pressure control solenoid valve
- Malfunction of clutch pressure control solenoid valve
- Malfunction of oil pump
- Malfunction of forward clutch
- Malfunction of reverse brake
- Malfunction of valve body assembly
- Malfunction of engine system
- Faulty CVT power train system

## DIAGNOSIS PROCEDURE

**STEP 1. M.U.T.-III diagnosis code**

Either of diagnosis codes 51 or 52 is set, inhibitor switch is defective.

**Q: Are diagnosis codes 51 or 52 output?**

**YES :** Refer to diagnosis code 51, 52: Inhibitor switch system P.23A-97.

**NO :** Go to Step 2.

**STEP 2. M.U.T.-III actuator test**

Item 01: Line pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 3.

**NO :** Replace the CVT assembly.

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**STEP 3. M.U.T.-III actuator test**

Item 04: Clutch pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 4.

**NO :** Refer to code No.34, 38: Clutch pressure control solenoid valve system P.23A-90.

**STEP 4. Hydraulic pressure test.**

Measure the following fluid pressures (Refer to P.23A-140).

a. Forward clutch pressure
b. Reverse brake pressure
c. Line pressure

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**

**YES :** Go to Step 9

**NO <"NG" for all items> :** Replace the CVT assembly.

**NO <"NG" for both "a" and "b"> :** Go to Step 5.

**NO <"NG" for either "a" or "b"> :** Go to Step 7.

**STEP 5. Replace the engine-CVT-ECU and then recheck the symptom.**

(1) Replace the engine-CVT-ECU.
(2) Test drive the vehicle.
(3) Check if the symptom.

**Q: Does a malfunction take place again?**

**YES :** Go to Step 6.

**NO :** The inspection is complete.

**STEP 6. Disassemble, clean and assemble the valve body assembly.**

Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**

**YES :** The inspection is complete.

**NO :** Replace the valve body assembly.

**STEP 7. Check the forward clutch system and reverse brake system.**

(1) Remove the transmission assembly, the valve body cover and the valve body assembly.
(2) Blow air into the forward clutch and the reverse brake oil holes on the transmission case. Check that the piston moves and the air pressure is maintained.

**Q: Is the check result normal?**

**YES :** Go to Step 6.

**NO :** Go to Step 8.

**STEP 8. Check the forward clutch system and reverse brake system.**

Check the facing for seizure and the piston seal ring for damage and interference with the retainer (Refer to GROUP 23B - Forward Clutch P.23B-31 or Reverse Brake P.23B-34).

**Q: Is the check result normal?**

**YES :** The inspection is complete.

**NO :** Repair or replace the forward clutch and the reverse brake.

**STEP 9. Retest the system.**

(1) Test drive the vehicle.
(2) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Replace the CVT assembly.

**NO :** The inspection is complete.

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## Inspection Procedure 4: Fault at Vehicle Start (Engine Stall During Shift)

### COMMENTS ON TROUBLE SYMPTOM

If the engine stalls when the selector lever is shifted from "N" to "D" or "R" range while the engine is idling, the cause is probably a malfunction of the engine system, damper clutch control solenoid valve, valve body or torque converter.

### PROBABLE CAUSES

- Malfunction of engine system
- Malfunction of damper clutch control solenoid valve
- Malfunction of valve body assembly
- Malfunction of torque converter
- Malfunction of engine-CVT-ECU

### DIAGNOSIS PROCEDURE

**STEP 1. Engine system check**

Refer to GROUP 13A – Troubleshooting, Inspection Chart for Trouble Symptoms P.13A-231.

**Q: Is the check result normal?**

**YES :** Go to Step 2.
**NO :** Check for the relevant trouble symptom.

**STEP 2. M.U.T.-III actuator test**

Item 03: Damper clutch control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Refer to code No.33, 37: Damper clutch control solenoid valve system P.23A-86.

**STEP 3. Hydraulic pressure test.**

Measure the torque converter hydraulic pressure (Refer to P.23A-140).

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**

**YES :** Replace the torque converter.
**NO :** Go to Step 4.

**STEP 4. Disassemble, clean and assemble the valve body assembly.**

Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**

**YES :** Go to Step 5.
**NO :** Replace the valve body assembly.

**STEP 5. Retest the system.**

(1) Test drive the vehicle.
(2) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Replace the engine-CVT-ECU.
**NO :** The inspection is complete.

## Inspection Procedure 5: Fault at Vehicle Start (Shift Shock N to D, N to R)

### COMMENTS ON TROUBLE SYMPTOM

If harsh shifting is created when the selector lever is moved from the N to D, or from N to R with the engine idling, the clutch fluid pressure circuit, the forward clutch or the valve body may be defective.

### PROBABLE CAUSES

- Malfunction of line pressure control solenoid valve
- Malfunction of clutch pressure control solenoid valve
- Malfunction of clutch pressure hydraulic circuit
- Malfunction of forward clutch
- Malfunction of reverse brake
- Malfunction of valve body assembly
- Malfunction of engine-CVT-ECU

### DIAGNOSIS PROCEDURE

**STEP 1. M.U.T.-III actuator test**

Item 01: Line pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 2.
**NO :** Replace the CVT assembly.

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**STEP 2. M.U.T.-III actuator test**

Item 04: Clutch pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 3.

**NO :** Refer to code No.34, 38: Clutch pressure control solenoid valve system P.23A-90.

**STEP 3. Hydraulic pressure test.**

Measure the following fluid pressures (Refer to P.23A-140).

a. Forward clutch pressure
b. Reverse brake pressure
c. Line pressure

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**

**YES :** Go to Step 8.

**NO <"NG" for all items> :** Replace the CVT assembly.

**NO <"NG" for both "a" and "b"> :** Go to Step 4.

**NO <"NG" for either "a" or "b"> :** Go to Step 6.

**STEP 4. Replace the engine-CVT-ECU and then recheck the symptom.**

(1) Replace the engine-CVT-ECU.
(2) Test drive the vehicle.
(3) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Go to Step 5.

**NO :** The inspection is complete.

**STEP 5. Disassemble, clean and assemble the valve body assembly.**

Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**

**YES :** The inspection is complete.

**NO :** Replace the valve body assembly.

**STEP 6. Check the forward clutch system and reverse brake system.**

(1) Remove the transmission assembly, the valve body cover and the valve body assembly.
(2) Blow air into the forward clutch and the reverse brake oil holes on the transmission case. Check that the piston moves and the air pressure is maintained.

**Q: Is the check result normal?**

**YES :** Go to Step 5.

**NO :** Go to Step 7.

**STEP 7. Check the forward clutch and reverse brake.**

Check the facing for seizure and the piston seal ring for damage and interference with the retainer (Refer to GROUP 23B - Forward Clutch P.23B-31 or Reverse Brake P.23B-34).

**Q: Is the check result normal?**

**YES :** The inspection is complete.

**NO :** Repair or replace the forward clutch and the reverse brake.

**STEP 8. Retest the system.**

(1) Test drive the vehicle.
(2) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Replace the CVT assembly.

**NO :** The inspection is complete.

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## Inspection Procedure 6: Fault During Driving (Poor Acceleration)

### COMMENTS ON TROUBLE SYMPTOM

If transmission does not downshift (kickdown) with the accelerator pedal fully depressed, the engine system or the valve body system may be defective.

### PROBABLE CAUSES

- Malfunction of forward clutch
- Malfunction of reverse brake
- Malfunction of the engine-CVT-ECU
- Malfunction of the engine system
- Malfunction of valve body assembly
- Malfunction of the shift control solenoid valve
- Malfunction of line pressure control solenoid valve

### DIAGNOSIS PROCEDURE

**STEP 1. Engine system check**

Refer to GROUP 13A – Troubleshooting, Inspection Chart for Trouble Symptoms P.13A-231.

**Q: Is the check result normal?**

**YES :** Go to Step 2.
**NO :** Check for the relevant trouble symptom.

**STEP 2. M.U.T.-III actuator test**

Item 01: Line pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Replace the CVT assembly.

**STEP 3. M.U.T.-III actuator test**

Item 02: Shift control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Refer to code No.32, 36: Shift control solenoid valve system P.23A-82.

**STEP 4. Hydraulic pressure test.**

Measure the following fluid pressures (Refer to P.23A-140).

a. Forward clutch pressure
b. Reverse brake pressure
c. Line pressure

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**

**YES :** Go to Step 9.
**NO <"NG" for all items> :** Replace the CVT assembly.
**NO <"NG" for both "a" and "b"> :** Go to Step 5.
**NO <"NG" for either "a" or "b"> :** Go to Step 7.

**STEP 5. Replace the engine-CVT-ECU and then recheck the symptom.**

(1) Replace the engine-CVT-ECU.
(2) Test drive the vehicle.
(3) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES : .** Go to Step 6.
**NO : .** The inspection is complete.

**STEP 6. Disassemble, clean and assemble the valve body assembly.**

Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**

**YES :** The inspection is complete.
**NO :** Replace the valve body assembly.

**STEP 7. Check the forward clutch system and reverse brake system.**

(1) Remove the transmission assembly, the valve body cover and the valve body assembly.
(2) Blow air into the forward clutch and the reverse brake oil holes on the transmission case. Check that the piston moves and the air pressure is maintained.

**Q: Is the check result normal?**

**YES :** Go to Step 6.
**NO :** Go to Step 8.

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**STEP 8. Check the forward clutch and reverse brake.**

Check the facing for seizure and the piston seal ring for damage and interference with the retainer (Refer to GROUP 23B - Forward Clutch P.23B-31 or Reverse Brake P.23B-34).

**Q: Is the check result normal?**

**YES :** The inspection is complete.

**NO :** Repair or replace the forward clutch and the reverse brake.

**STEP 9. Retest the system.**

(1) Test drive the vehicle.

(2) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Replace the CVT assembly.

**NO :** The inspection is complete.

### Inspection Procedure 7: Fault During Driving (Vibration)

## COMMENTS ON TROUBLE SYMPTOM

If vibration is produced during driving at 20 km/h or more, the torque converter (damper clutch) pressure, the engine system, the damper clutch control solenoid valve, the torque converter (damper clutch) or the valve body may be faulty.

## PROBABLE CAUSES

- Malfunction of torque converter pressure
- Malfunction of engine system
- Malfunction of damper clutch control solenoid valve
- Malfunction of torque converter
- Malfunction of valve body assembly
- Malfunction of engine-CVT-ECU
- Malfunction of the line pressure control solenoid valve

## DIAGNOSIS PROCEDURE

**STEP 1. M.U.T.-III actuator test**

Item 01: Line pressure control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 2.

**NO :** Replace the CVT assembly.

**STEP 2. M.U.T.-III actuator test**

Item 03: Damper clutch control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 3.

**NO :** Refer to code No.33, 37: Damper clutch control solenoid valve system P.23A-86.

**STEP 3. Hydraulic pressure test.**

Measure the torque converter hydraulic pressure (Refer to P.23A-140).

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**

**YES :** Replace the torque converter.

**NO :** Go to Step 4.

**STEP 4. Disassemble, clean and assemble the valve body assembly.**

Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**

**YES :** Go to Step 5.

**NO :** Replace the valve body assembly.

**STEP 5. Retest the system.**

(1) Test drive the vehicle.

(2) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Replace the engine-CVT-ECU.

**NO :** The inspection is complete.

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### Inspection Procedure 8: Fault During Driving (Excessive Engine Brake Operated)

## COMMENTS ON TROUBLE SYMPTOM

If you feel a sense of "engine braking with low gear engaged" during driving downhill, the engine system or the valve body system may be defective.

## PROBABLE CAUSES

- Aging of CVT fluid
- Malfunction of valve body assembly
- Malfunction of the shift control solenoid valve
- Malfunction of the engine-CVT-ECU
- Malfunction of the primary pressure sensor
- Malfunction of the engine system

## DIAGNOSIS PROCEDURE

**STEP 1. Engine system check**

Refer to GROUP 13A – Troubleshooting, Inspection Chart for Trouble Symptoms P.13A-231.

**Q: Is the check result normal?**

**YES :** Go to Step 2.
**NO :** Check for the relevant trouble symptom.

**STEP 2. M.U.T.-III actuator test**

Item 02: Shift control solenoid valve

**OK: Operating sound can be heard.**

**Q: Is the check result normal?**

**YES :** Go to Step 3.
**NO :** Refer to code No.32, 36: Shift control solenoid valve system P.23A-82.

**STEP 3. M.U.T.-III data list**

Item 11: Primary pressure sensor (Refer to Data List Table P.23A-123).

**Q: Is the check result normal?**

**YES :** Go to Step 4.
**NO :** Replace the primary pressure sensor (Refer to P.23A-155).

**STEP 4. Hydraulic pressure test.**

Measure the primary hydraulic pressure (Refer to P.23A-140).

**OK: Refer to P.23A-140.**

**Q: Is the check result normal?**

**YES :** Go to Step 7.
**NO :** Go to Step 5.

**STEP 5. Replace the engine-CVT-ECU and then recheck the symptom.**

(1) Replace the engine-CVT-ECU.
(2) Test drive the vehicle.
(3) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Go to Step 6.
**NO :** The inspection is complete.

**STEP 6. Disassemble, clean and assemble the valve body assembly.**

Check the mounting bolts for looseness, and the O-ring, solenoid valve and valve body for damage.

**Q: Is the check result normal?**

**YES :** The inspection is complete.
**NO :** Replace the valve body assembly.

**STEP 7. Replace the engine-CVT-ECU and then recheck the symptom.**

(1) Replace the engine-CVT-ECU.
(2) Test drive the vehicle.
(3) Check the trouble symptom again.

**Q: Does a malfunction take place again?**

**YES :** Replace the CVT assembly.
**NO :** The inspection is complete.

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## Inspection Procedure 9: CVT Indicator Lamp System

**⚠ CAUTION**
**Whenever the ECU is replaced, ensure that the communication circuit is normal.**

### OPERATION

The CVT indicator lamp detects the selector lever position (P, R, N, D, Ds, L), and displays it on the combination meter.

### COMMENTS ON TROUBLE SYMPTOM

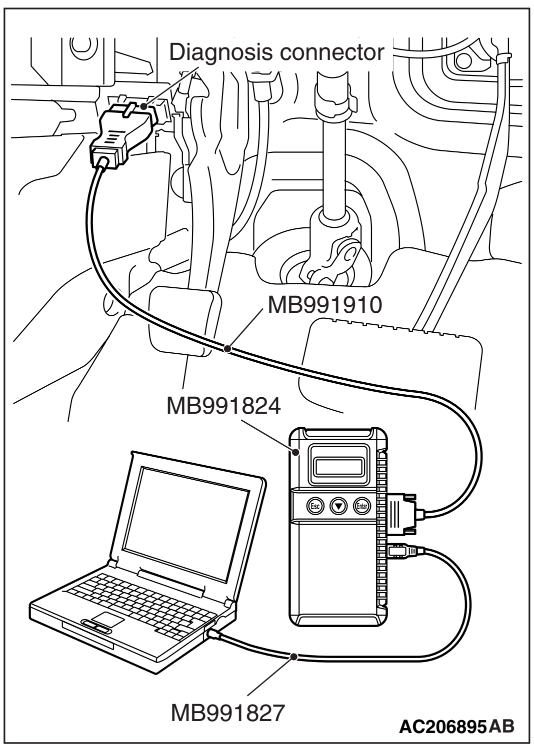
Connector(s) or wiring harness in the CAN bus lines between the engine-CVT-ECU and the combination meter, the power supply system to the engine-CVT-ECU, the combination meter, or the engine-CVT-ECU may be defective.

### PROBABLE CAUSES

- The communication line is defective.
- Malfunction of combination meter
- Malfunction of the engine-CVT-ECU

### DIAGNOSIS PROCEDURE

#### STEP 1. M.U.T.-III CAN bus diagnostics




Use the M.U.T.-III to diagnose the CAN bus lines.

**Q: Is the check result normal?**
**YES :** Go to Step 2.
**NO :** Repair the CAN bus line (Refer to GROUP 54D – Troubleshooting, Diagnosis Code Table P.54D-13).

#### STEP 2. M.U.T.-III actuator test

Execute combination meter actuator test.

- Item A2: All shift position indicator lamps illuminate.
- Item A3: All shift position indicator lamps go out.

**OK: All shift position indicator lamps illuminate or go out.**

**Q: Is the check result normal?**
**YES :** Replace the engine-CVT-ECU.
**NO :** Go to Step 3.

#### STEP 3. Check the speedometer.

Use the M.U.T.-III to enter simulated vehicle speed.

**OK: The speedometer shows that simulated vehicle speed.**

**Q: Is the check result normal?**
**YES :** Replace the combination meter.
**NO :** Diagnose the combination meter (Refer to GROUP 54A – Combination Meter, Troubleshooting P.54A-31).

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## DATA LIST REFERENCE TABLE

M1231208100115

| Data list No. | Check item | Inspection conditions | | Normal condition |
|---|---|---|---|---|
| 01 | Crank angle sensor | • Engine: Idling<br>• Selector lever position: P | Accelerator pedal: Fully closed | 600 – 800 r/min |
| | | | Accelerator pedal: Depressed | Gradually increases from the above value. |
| 02 | Turbine speed sensor | • Engine: Idling<br>• Selector lever position: P | Accelerator pedal: Fully closed | 600 – 800 r/min |
| 03 | Primary speed sensor | During driving except for at start and stop. | | Value equal to turbine speed is indicated. |
| 04 | Secondary speed sensor | During driving except for at start and stop. | Constant driving at 50 km/h on flat road. | 2,200 – 2,400 r/min |
| 06 | Accelerator pedal position sensor (APS) | • Ignition switch: ON<br>• Selector lever position: P | Accelerator pedal: Fully closed | 800 – 1,200 mV |
| | | | Accelerator pedal: Depressed | Gradually increases from the above value. |
| | | | Accelerator pedal: Fully open | 4,000 mV or more |
| 08 | CVT fluid temperature sensor | Driving after engine has warmed up | Increase CVT fluid temperature in the range of 45 – 100°C during driving for over 15 minutes. | Gradually increases to 45 – 100°C |
| 09 | Line pressure sensor | • Engine: Idling<br>• Selector lever position: P | Accelerator pedal: Fully closed | 0.6 – 1.5 MPa |
| 10 | Damper clutch amount of slippage | Engine: Idling | Depress brake pedal to shift selector lever to N to D. | Less than 20 – 408 r/min |
| | | During driving | Constant driving at 50 km/h on flat road. | Less than 40 r/min |
| 11 | Primary pressure sensor | • Engine: Idling<br>• Selector lever position: P | Accelerator pedal: Fully closed | 0 – 0.6 MPa |
| 12 | Gear ratio | • Engine: Idling<br>• Selector lever position: P | Accelerator pedal: Fully closed | 2.313 |
| 14 | Damper clutch control solenoid valve duty ratio | Parked at idle speed → Driving | 0-Start → Constant driving at 50 km/h on flat road. | 0% to 35% or more |
| 15 | Shift control solenoid valve duty ratio | During driving | Selector lever position: D to Ds | Value increases momentarily |
| | | | Selector lever position: Ds to D | Value decrease momentarily |

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| Data list No. | Check item | Inspection conditions | | Normal condition |
|---|---|---|---|---|
| 16 | Line pressure control solenoid valve duty ratio | Engine: Idling | | 70 – 90% |
| 17 | Clutch pressure control solenoid valve duty ratio | Engine: Idling | • Depress brake pedal to shift N to R<br>• Depress brake pedal to shift N to D | 99.6% → 0% |
| 24 | System voltage | Ignition switch: ON | | System voltage |
| 25 | Relay voltage | Ignition switch: ON | | System voltage |
| 26 | Inhibitor switch | • Ignition switch: ON<br>• Engine: Stopped | Selector lever position: P | P |
| | | | Selector lever position: R | R |
| | | | Selector lever position: N | N |
| | | | Selector lever position: D | D |
| | | | Selector lever position: Ds | DS |
| | | | Selector lever position: L | L |
| 33 | Stop lamp switch | • Ignition switch: ON<br>• Engine: Stopped | Brake pedal: Depressed | ON |
| | | | Brake pedal: Released | OFF |

## LEARNED VALUE

CVT-related learned values can be seen by selecting these items.

| Data list No. | Item |
|---|---|
| 00 to 17, 0A to 0F | Lock-up control learned value |
| 18 to 59, 1A to 1F, 2A to 2F, 3A to 3F, 4A to 4F, 5A to 5D | Line pressure control learned value |
| 5E, 5F, 60 to 71, 6A to 6F | N to D shift duty learned value |
| 72 to 85, 7A to 7F | N to R shift duty learned value |
| 86 to 99, 8A to 7F | N to D shift time learned value |
| 9A to 9F, A0 to A9, AA to AD | N to R shift time learned value |
| AE | TPS learned value |
| AF, B0 to B6 | Shift control learned value |

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## ACTUATOR TEST JUDGMENT VALUE

M1231208200112

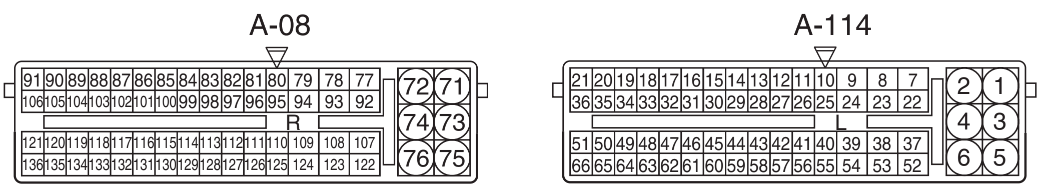
| Item No. | Inspection item | Test description | Inspection condition | Normal status |
|---|---|---|---|---|
| 01 | Line pressure control solenoid valve | • Actuate solenoid valve indicated by M.U.T.-III for 5 seconds at duty ratio of 50%. • Other remaining solenoid valves are not ON. | • Ignition switch: ON • Selector lever position: P • Engine: Stopped • TPS voltage: 1.3 V or less | When solenoid valve is actuated, operating sound is audible. |
| 02 | Shift control solenoid valve | | | |
| 03 | Damper clutch control solenoid valve | | | |
| 04 | Clutch pressure control solenoid valve | | | |
| 11 | CVT control relay | Switch off CVT control (solenoid) relay for 3 seconds. | | Data list item No.25 • During test: 0 V • Normal: System voltage (V) |

## CHECK AT ENGINE-CVT-ECU TERMINALS

M1231229100143

1. Disconnect the engine-CVT-ECU connector, and connect the special tool Power plant ECU check harness (MB991987) inbetween.
2. Measure the voltage between each of the special tool Check harness connector terminals and earth (No.72 or 74).

Special tool Check harness (MB991987) connector




AC402960AC

| Terminal No. | Check item | Inspection condition | Standard value |
|---|---|---|---|
| 1 | Damper clutch control solenoid valve | • Engine: Idling • Selector lever position: P | System voltage |
| 2 | Shift control solenoid valve | • Engine: Idling • Selector lever position: P | Approximately 11 V |
| 3 | Clutch pressure control solenoid valve | • Engine: Idling • Selector lever position: N → D or N → R | Approximately 10 V → System voltage |
| 4 | Line pressure control solenoid valve | • Engine: Idling • Selector lever position: P | 10 – 11 V |
| 11 | Line pressure sensor | • Engine: Idling • Selector lever position: P • Accelerator pedal: Full closed | 0.9 – 1.4 V |

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| Terminal No. | Check item | Inspection condition | Standard value |
|---|---|---|---|
| 18 | CVT fluid temperature sensor | • Ignition switch: ON<br>• CVT fluid temperature: 20°C | 3.8 – 4.0 V |
| | | • Ignition switch: ON<br>• CVT fluid temperature: 40°C | 3.2 – 3.4 V |
| | | • Ignition switch: ON<br>• CVT fluid temperature: 80°C | 1.7 – 1.9 V |
| 19 | CVT fluid temperature sensor earth | Always | 1 V or less |
| 26 | Line pressure sensor earth | Always | 1 V or less |
| 41 | Primary pressure sensor | • Engine: Idling<br>• Selector lever position: P<br>• Accelerator pedal: Full closed | 0.5 – 0.9 V |
| 42 | Primary pressure sensor earth | Always | 1 V or less |
| 43 | Primary speed sensor | • Selector lever position: D<br>• Constant driving at 50 km/h<br>• Measure between terminals 43 and 60 with an oscilloscope | Refer to P.23A-128, Inspection Procedure Using an Oscilloscope. |
| 44 | Turbine speed sensor | • Selector lever position: D<br>• Constant driving at 50 km/h<br>• Measure between terminals 44 and 60 with an oscilloscope | Refer to P.23A-128, Inspection Procedure Using an Oscilloscope. |
| 45 | Secondary speed sensor | • Selector lever position: D<br>• Constant driving at 50 km/h<br>• Measure between terminals 45 and 60 with an oscilloscope | Refer to P.23A-128, Inspection Procedure Using an Oscilloscope. |
| 46 | Inhibitor switch: P | • Ignition switch: ON<br>• Selector lever position: P | System voltage |
| | | • Ignition switch: ON<br>• Selector lever position: Other than above | 1 V or less |
| 47 | Inhibitor switch: L | • Ignition switch: ON<br>• Selector lever position: L | System voltage |
| | | • Ignition switch: ON<br>• Selector lever position: Other than above | 1 V or less |
| 48 | Inhibitor switch: R | • Ignition switch: ON<br>• Selector lever position: R | System voltage |
| | | • Ignition switch: ON<br>• Selector lever position: Other than above | 1 V or less |
| 58 | Primary pressure sensor power supply | Ignition switch: ON | 4.9 – 5.1 V |
| 59 | Line pressure sensor power supply | Ignition switch: ON | 4.9 – 5.1 V |
| 60 | Speed sensor earth | Always | 1 V or less |

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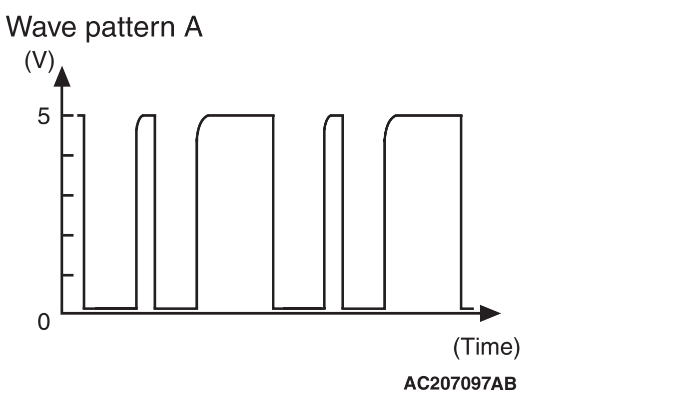
| Terminal No. | Check item | Inspection condition | | Standard value |
|---|---|---|---|---|
| 61 | Inhibitor switch: Ds | • Ignition switch: ON<br>• Selector lever position: Ds | | System voltage |
| | | • Ignition switch: ON<br>• Selector lever position: Other than above | | 1 V or less |
| 62 | Inhibitor switch: D | • Ignition switch: ON<br>• Selector lever position: D | | System voltage |
| | | • Ignition switch: ON<br>• Selector lever position: Other than above | | 1 V or less |
| 63 | Inhibitor switch: N | • Ignition switch: ON<br>• Selector lever position: N | | System voltage |
| | | • Ignition switch: ON<br>• Selector lever position: Other than above | | 1 V or less |
| 71 | Solenoid valve power supply | Ignition switch: LOCK (OFF) position | | 1 V or less |
| | | Ignition switch: ON | | System voltage |
| 72 | Earth | Always | | 1 V or less |
| 73 | Solenoid valve power supply | Ignition switch: LOCK (OFF) position | | 1 V or less |
| | | Ignition switch: ON | | System voltage |
| 74 | Earth | Always | | 1 V or less |
| 82 | Back-up power supply | Always | | System voltage |
| 83 | APS signal | Ignition switch: ON | Accelerator pedal: Released | 0.8 – 1.2 V |
| | | | Accelerator pedal: Depressed | 4 V or more |
| 84 | APS earth | Always | | 0.5 V or less |
| 85 | APS power supply | Ignition switch: ON | | 4.9 – 5.1 V |
| 124 | CVT control relay | Ignition switch: LOCK (OFF) position | | System voltage |
| | | Ignition switch: ON | | 1 V or less |
| 128 | Stoplamp switch | Brake pedal: Depressed | | System voltage |
| | | Brake pedal: Released | | 1 V or less |

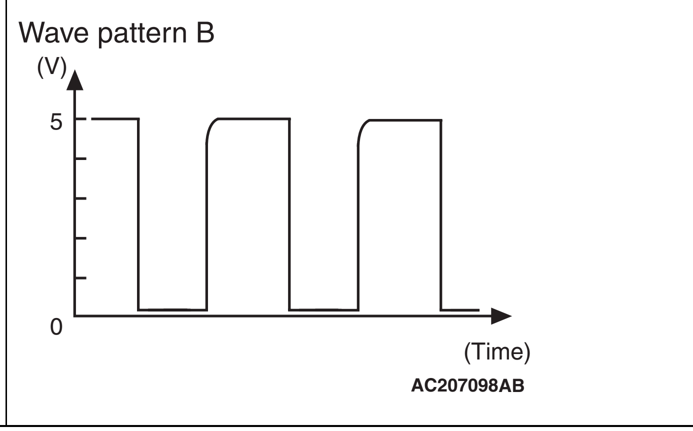
## OSCILLOSCOPE INSPECTION PROCEDURE

M1231208500083

| Terminal No. | Check item | Inspection conditions | Normal condition (Waveform sample) |
|---|---|---|---|
| 44 | Turbine speed sensor | • Selector lever position: D<br>• Driving at constant speed of 50 km/h | Waveform A |
| 43 | Primary speed sensor | | Waveform B |
| 45 | Secondary speed sensor | | |

### WAVEFORM SAMPLE



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# TROUBLESHOOTING <CVT KEY INTERLOCK AND SHIFT LOCK MECHANISMS>

## INSPECTION CHART FOR TROUBLE SYMPTOMS

M1232102000042

| Trouble symptom | Inspection procedure No. | Reference page |
|---|---|---|
| When the ignition key is at a position other than the LOCK (OFF) position, the selector lever can be moved from the P to the R position even though the brake pedal is not depressed. | 1 | P.23A-129 |
| When the ignition key is at a position other than the LOCK (OFF) position, the selector lever cannot be moved from the P to the R position even though the brake pedal is being depressed. | 2 | P.23A-130 |
| The ignition key is at the LOCK (OFF) position, but the selector lever can be moved from the P to the R position when the brake pedal is depressed. | 3 | P.23A-130 |
| The selector lever cannot be easily moved from the P to the R position. | 4 | P.23A-130 |
| The selector lever cannot be moved from the R to the P position. | 5 | P.23A-130 |
| The ignition key cannot be turned to the LOCK (OFF) position when the selector lever is at the P position. | 6 | P.23A-131 |
| The ignition key can be turned to the LOCK (OFF) position when the selector lever is at a position other than the P position. | 7 | P.23A-131 |

## INSPECTION PROCEDURES FOR TROUBLE SYMPTOM

**Inspection Procedure 1: When the ignition key is at a position other than the LOCK (OFF) position, the selector lever can be moved from the P to the R position even though the brake pedal is not depressed.**

### COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the selector lever assembly lock cam or shift lock cable.

### PROBABLE CAUSES

- Malfunction of lock cam
- Malfunction of shift lock cable

### DIAGNOSIS PROCEDURE

Check by referring to the possible causes.

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**Inspection Procedure 2: When the ignition key is at a position other than the LOCK (OFF) position, the selector lever cannot be moved from the P to the R position even though the brake pedal is being depressed.**

## COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the selector lever assembly, transmission control cable, shift lock cable, key interlock cable or engine starting switch assembly.

## PROBABLE CAUSES

- Malfunction of selector lever assembly
- Malfunction of transmission control cable
- Malfunction of shift lock cable
- Malfunction of key interlock cable
- Malfunction of engine starting switch assembly

## DIAGNOSIS PROCEDURE

Check by referring to the possible causes.

**Inspection Procedure 3: The ignition key is at the LOCK (OFF) position, but the selector lever can be moved from the P to the R position when the brake pedal is depressed.**

## COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the key interlock cable, selector lever assembly or engine starting switch assembly.

## PROBABLE CAUSES

- Malfunction of key interlock cable
- Malfunction of selector lever assembly
- Malfunction of engine starting switch assembly

## DIAGNOSIS PROCEDURE

Check by referring to the possible causes.

**Inspection Procedure 4: The selector lever cannot be easily moved from the P to the R position.**

## COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the selector lever assembly, transmission control cable, shift lock cable, key interlock cable or engine starting switch assembly.

## PROBABLE CAUSES

- Malfunction of selector lever assembly
- Malfunction of transmission control cable
- Malfunction of shift lock cable
- Malfunction of key interlock cable
- Malfunction of engine starting switch assembly

## DIAGNOSIS PROCEDURE

Check by referring to the possible causes.

**Inspection Procedure 5: The selector lever cannot be moved from the R to the P position.**

## COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the selector lever assembly or transmission control cable.

## PROBABLE CAUSES

- Malfunction of selector lever assembly
- Malfunction of transmission control cable

## DIAGNOSIS PROCEDURE

Check by referring to the possible causes.

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**Inspection Procedure 6: The ignition key cannot be turned to the LOCK (OFF) position when the selector lever is at the P position.**

## COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the selector lever assembly, key interlock cable or engine starting switch assembly.

## PROBABLE CAUSES

- Malfunction of selector lever assembly
- Malfunction of key interlock cable
- Malfunction of engine starting switch assembly

## DIAGNOSIS PROCEDURE

Check by referring to the possible causes.

**Inspection Procedure 7: The ignition key can be turned to the LOCK (OFF) position when the selector lever is at a position other than the P position.**

## COMMENTS ON TROUBLE SYMPTOM

The cause is probably a malfunction of the key interlock cable or engine starting switch assembly.

## PROBABLE CAUSES

- Malfunction of key interlock cable
- Malfunction of engine starting switch assembly

## DIAGNOSIS PROCEDURE

Check by referring to the possible causes.

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# ON-VEHICLE SERVICE

## ESSENTIAL SERVICE

### TRANSMISSION FLUID (CVT FLUID) CHECK

M1231200900054

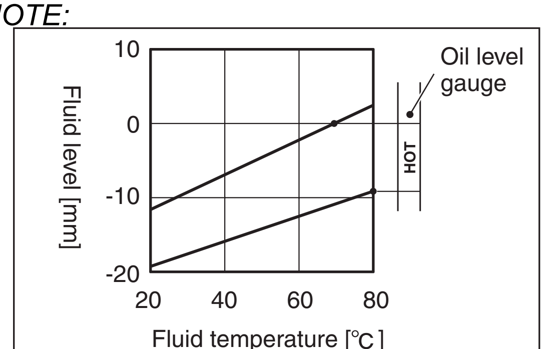
⚠ CAUTION

**When replacing the transmission with a new one, overhauling the existing transmission, or driving in a harsh condition, the CVT fluid cooler line should always be flushed out and CVT fluid should be replaced with a new one.**

1. Drive the vehicle until the CVT fluid temperature reaches the normal temperature (70 – 80°C)

   *NOTE: Measure CVT fluid temperature using M.U.T.-III.*

   *NOTE:*

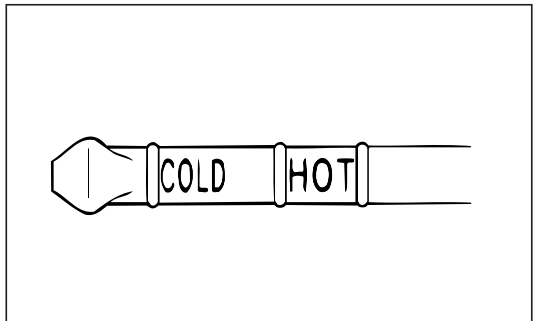



AC208545AB

   *Check the oil level referring to the characteristics chart shown at left if it takes some time to reach the normal operation temperature of CVT fluid (70 – 80°C).*

2. Park the vehicle on a level surface.
3. Move the selector lever to all positions to fully charge the torque converter and the fluid lines with CVT fluid, and then move the selector lever to the N position.
4. After wiping away any dirt from around the oil level gauge, pull out the oil level gauge and check the level of CVT fluid.

   *NOTE: If the CVT fluid has a burnt smell, or if it has become very contaminated or dirty, it means that the CVT fluid has become contaminated by minute particles form bushings (metal) or worn parts. In such a case, the transmission needs to be overhauled and the CVT fluid cooler line needs to be flushed out.*




AC005861

5. Check that the CVT fluid level is between the HOT marks on the oil level gauge. If the CVT fluid level is too low, add more CVT fluid until the level reaches between the HOT marks.

   **CVT fluid: DIA QUEEN ATF SP III**

   *NOTE: If the CVT fluid level is too low, the oil pump draws air into the system along with the CVT fluid, and air bubbles will thus from in the fluid circuit. This will cause a drop in fluid pressure and cause the shift points to change and the clutches and brakes to slip. If the CVT fluid level is too high, the gear will churn the CVT fluid and cause bubbles to develop, which can then cause the same problems as when the CVT fluid is too low. In either case, the air bubbles can cause overheating and oxidation of the CVT fluid, and also prevent the valves, clutches and brakes from operating normally. In addition, if bubbles develop in the CVT fluid, the CVT fluid can overflow from the transmission vent holes and be mistaken for leaks.*

6. Securely re-insert the oil level gauge.

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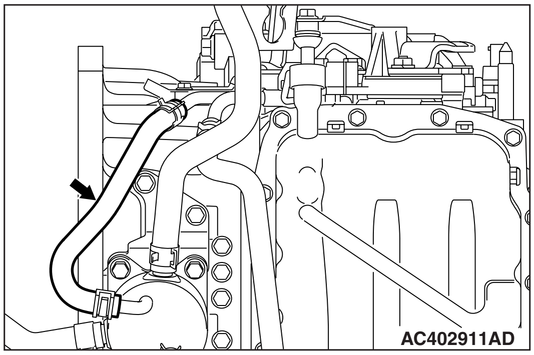
## TRANSMISSION FLUID (CVT FLUID) REPLACEMENT

M1231201000117

⚠ CAUTION

**Before replacing the transmission with a new one, overhauling the existing transmission, or connecting the cooler pipe to the transmission, the CVT fluid cooler line should always be flushed out.**

In you have an CVT fluid changer, use the CVT fluid changer to flush the CVT fluid. If you do not have an CVT fluid changer, follow the procedure given below.



AC402911AD

1. Disconnect the hose shown in the figure through which the CVT fluid flows from the ATF warmer (ATF cooler) to the transmission.

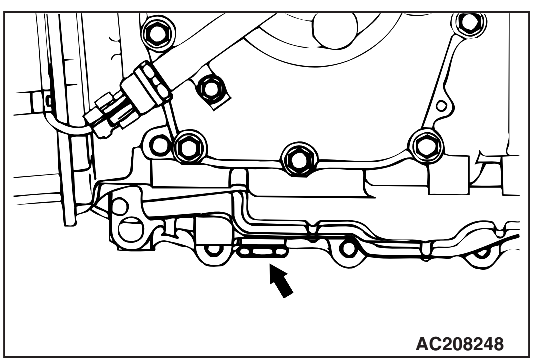
⚠ CAUTION

**The engine should be stopped within one minute of it being started. If the CVT fluid has all been discharged before this, stop the engine at that point.**

2. Start the engine and discharge the CVT fluid.

   Driving conditions: N range, idling

   **Discharge amount: Approx. 3.5 L**



AC208248

3. Remove the drain plug at the bottom of the transmission case to drain out the remaining CVT fluid.

   **Discharge amount: Approx. 2.0 L**

4. Install the drain plug with a gasket in between, and tighten it to the specified torque.

   **Tightening torque: 32 ± 2 N·m**

⚠ CAUTION

**Stop pouring in the CVT fluid once 5.5 L has been poured in.**

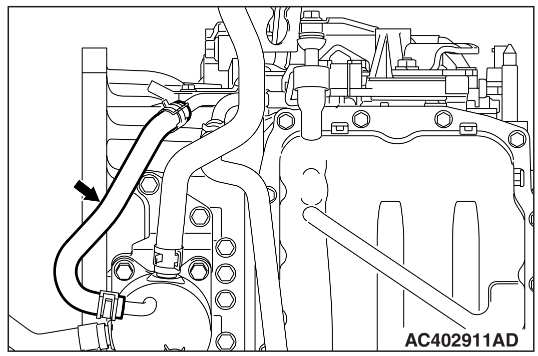
5. Pour in new CVT fluid through the oil filler tube.

   **Amount to add: Approx. 5.5 L**

6. Repeat the operation in step 2.
7. Pour in new CVT fluid through the oil filler tube.

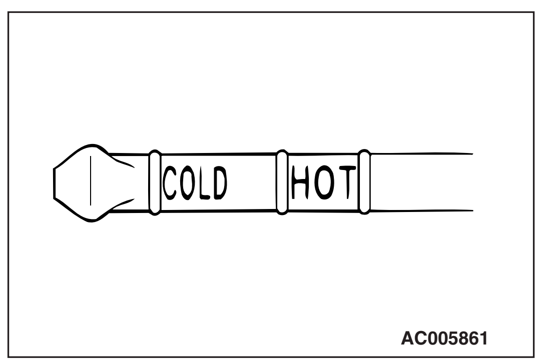
   **Amount to add: Approx. 3.5 L**

   *NOTE: Carry out steps 2 and 7 so that at least 8.0 L has been discharged from the cooler hose. After this, discharge a small quantity of CVT fluid and check for contamination. If the CVT fluid is contaminated, repeat steps 6 and 7.*



AC402911AD

8. Connect the hose which was disconnected in step 1, and then securely re-insert the oil level gauge.
9. Start the engine, and let it run at idle for 1 – 2 minutes.
10. Move the selector lever to all positions once, and then return it to the N position.




AC005861

11. Check that the CVT fluid level on the oil level gauge is at the COLD mark. if it is not up to this mark, add more CVT fluid.

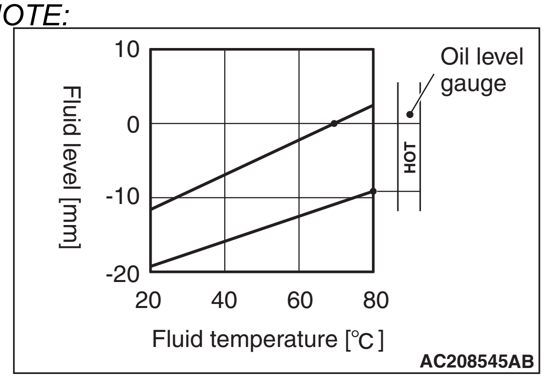
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12. Drive the vehicle until the CVT Fluid temperature reaches the normal temperature (70 – 80°C), and then re check the CVT fluid level.

*NOTE: The COLD mark is for reference only; the HOT marks should be used as the standard for judgment.*

*NOTE: CVT fluid temperature using M.U.T.-III.*

*NOTE:*




*Check the oil level referring to the characteristics chart shown at left if it takes some time until reaching the normal operation temperature of CVT fluid (70 – 80°C).*

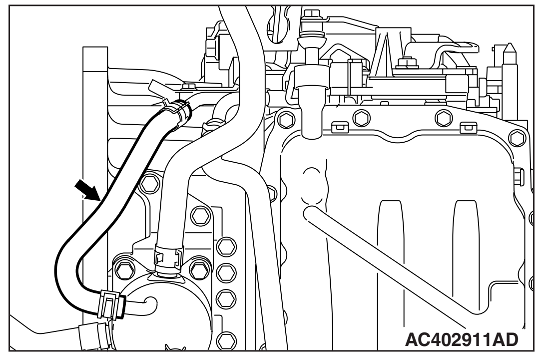
13. When CVT fluid is under the specified level, top up CVT fluid. When CVT fluid is over the specified level, drain the excessive CVT fluid from the drain plug to adjust CVT fluid level to the specified level.
14. Securely insert the oil level gauge into the oil filler tube.

## TRANSMISSION FLUID (CVT FLUID) COOLER LINE FLUSHING

M1231229200117

**⚠ CAUTION**

**If replacing the transmission with a new one, if overhauling the existing transmission, or if the CVT fluid has deteriorated or is contaminated, the CVT fluid cooler line must always be flushed out.**




1. Disconnect the hose shown in the figure through which the CVT fluid flows from the ATF warmer (ATF cooler) to the transmission.

**⚠ CAUTION**

**The engine should be stopped within one minute of it being started. If the CVT fluid has all been discharged before this, stop the engine at that point.**

2. Start the engine and discharge the CVT fluid.

   Driving conditions: N range, idling

   **Discharge amount: Approx. 3.5 L**

**⚠ CAUTION**

**Stop pouring in the CVT fluid once 3.5 L has been poured in.**

3. Pour in new CVT fluid through the oil filler tube.

   **Amount to add: Approx. 3.5 L**

4. Repeat the operation in step 2 and 3.

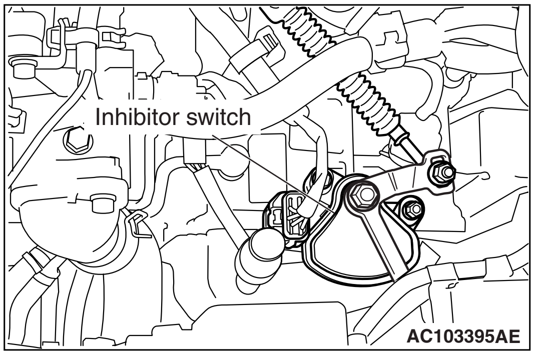
   *NOTE: Carry out steps 2 and 3 so that at least 8.0 L has been discharged from the cooler hose. After this, discharge a small quantity of CVT fluid and check for contamination. If the CVT fluid is contaminated, repeat steps 2 and 3.*

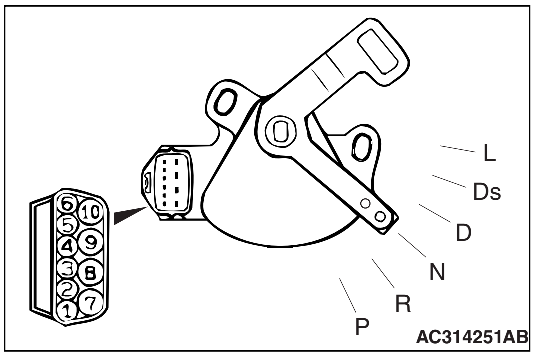
5. Carry out the procedure in "Transmission Fluid (CVT Fluid) Replacement" from step 2 onwards.

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## INHIBITOR SWITCH CONTINUITY CHECK

M1231201400182



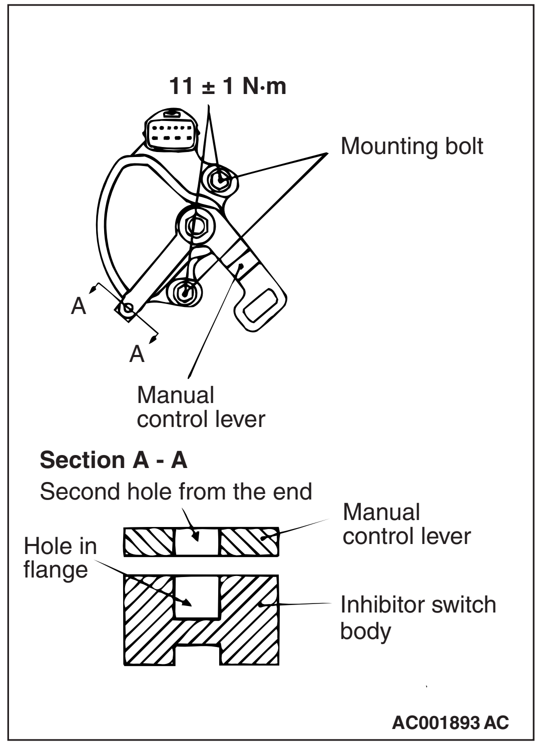




| Item | Terminal No. | Resistance |
|---|---|---|
| P | 3 – 8, 9 – 10 | Less than 2 Ω |
| R | 7 – 8 | |
| N | 4 – 8, 9 – 10 | |
| D | 1 – 8 | |
| Ds | 5 – 8 | |
| L | 2 – 8 | |

## INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

M1231201500048

1. Move the selector lever to the N position.
2. Loosen the adjusting nut, and set the manual control lever upper and lower to the free condition.
3. Move the manual control lever lower to the neutral position.




4. Loosen the inhibitor switch body mounting bolts, and then turn the inhibitor switch body to align the second hole from the end of the manual control lever with the hole in the inhibitor switch body flange (section A – A).

   *NOTE: The inhibitor switch body can be aligned by hand, because the manual control lever end is as wide as the switch body flange. Alternatively, the inhibitor switch can also be aligned by inserting a 5-mm bar in the second hole from the end of the manual control lever and the hole in the inhibitor switch body flange.*

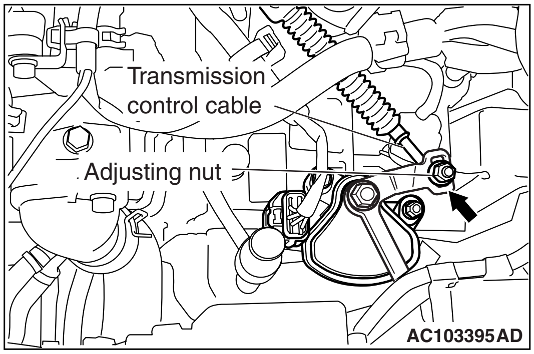
**⚠ CAUTION**

**Be careful not let the inhibitor switch body slip out of place.**

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5. Tighten the inhibitor switch body mounting bolts to the specified torque.

   **Tightening torque: 11 ± 1 N·m**




6. Gently push the transmission control cable in the direction of the arrow to tighten the adjusting nut to the specified torque.

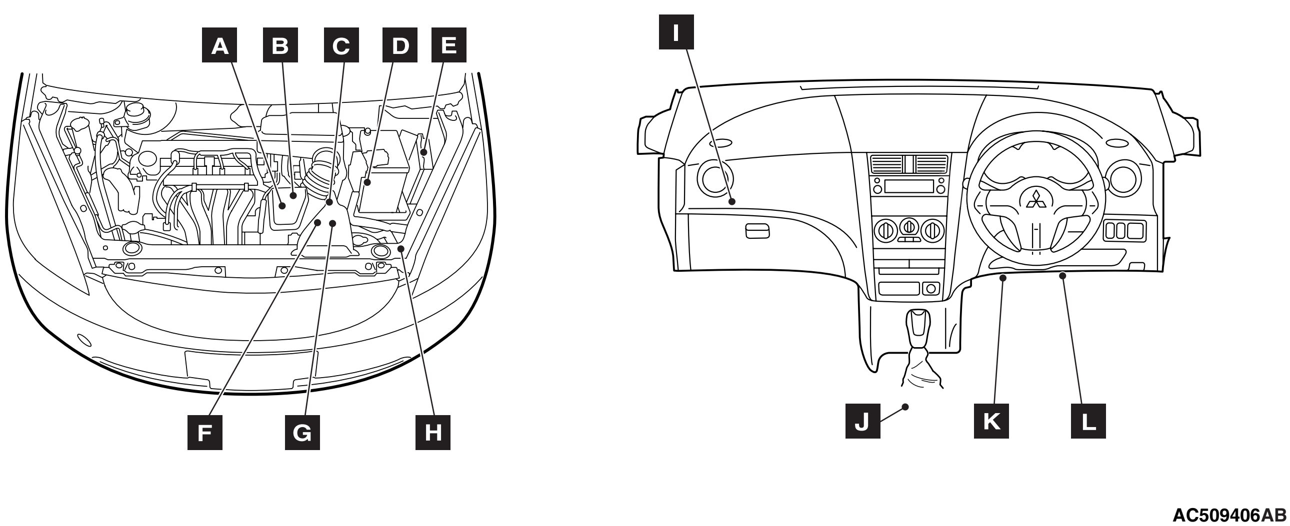
   **Tightening torque: 12 ± 2 N·m**

7. Check that the selector lever is at the N position.
8. Check that the transmission shifts to the correct range corresponding to the position of the selector lever, and that it functions correctly in that range.

## CVT CONTROL COMPONENT LOCATION

M1231208600110

| Name | Symbol | Name | Symbol |
|---|---|---|---|
| CVT control relay | I | Line pressure sensor | D |
| CVT control solenoid valve assembly | G | Primary pressure sensor | H |
| CVT fluid temperature sensor | G | Primary speed sensor | C |
| Diagnosis connector | K | Secondary speed sensor | B |
| Engine-CVT-ECU | E | Stop lamp switch | L |
| Inhibitor switch | F | Turbine speed sensor | A |



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# CVT CONTROL COMPONENT CHECKS

## INHIBITOR SWITCH CHECK

M1231201400159

Refer to P.23A-135.

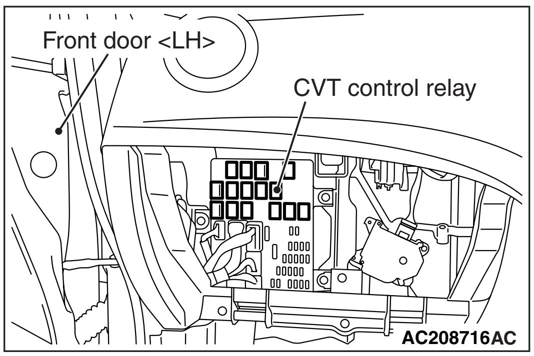
## STOP LAMP SWITCH CHECK

M1231210100060

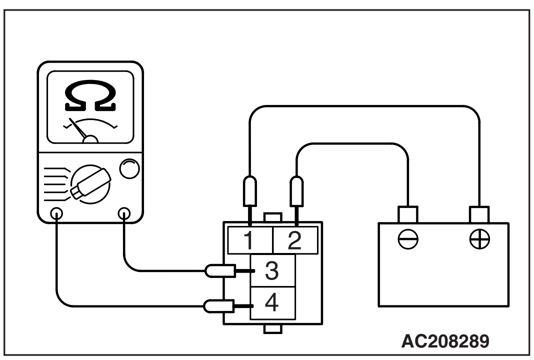
Refer to GROUP 35A – Brake pedal, Inspection P.35A-22.

## CVT CONTROL RELAY CHECK

M1231229400047




1. Removal the CVT control relay.



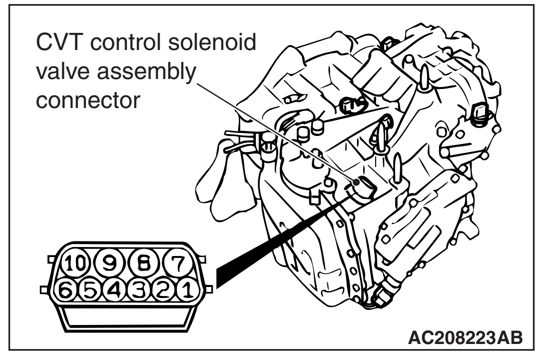

2. Use the jumper leads to connect CVT control relay terminal 2 to the negative battery terminal and terminal 1 to the positive battery terminal.
3. Check the continuity between CVT control relay connector terminals 3 and 4 while alternately connecting and disconnecting the jumper leads from the battery terminals.

| Jumper leads | Continuity between terminals 3 and 4 |
|---|---|
| Connected | Less than 2 Ω |
| Disconnected | Open circuit |

4. If there is a malfunction, replace the CVT control relay.

# CVT CONTROL SOLENOID VALVE ASSEMBLY CHECK

M1231229500130



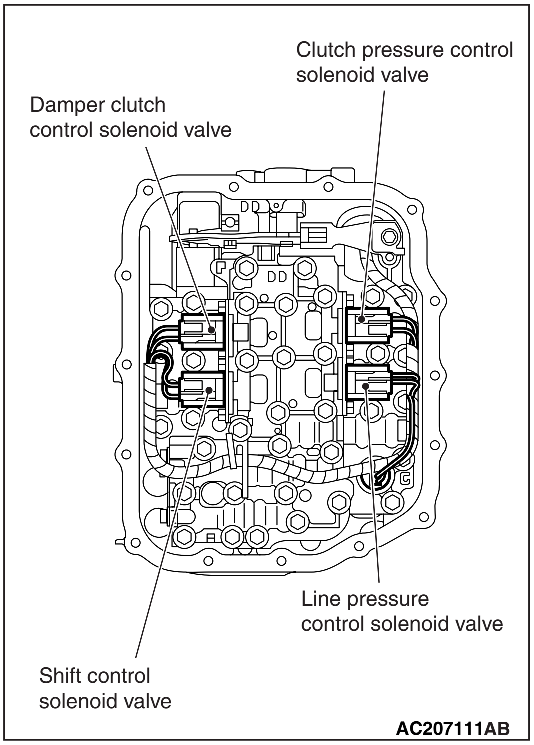

1. Disconnect the CVT control solenoid valve assembly connector.
2. Measure the resistance between the solenoid valve terminals.

**STANDARD VALUE:**

| Terminal No. | Name | Resistance value |
|---|---|---|
| 3 – 10 | Damper clutch control solenoid valve | 2.9 – 3.5 Ω (CVT fluid temperature 20°C) |
| 5 – 9 | Shift control solenoid valve | |
| 6 – 10 | Line pressure control solenoid valve | |
| 4 – 9 | Clutch pressure control solenoid valve | |
| 9,10 – Body earth | – | 1 kΩ or more |

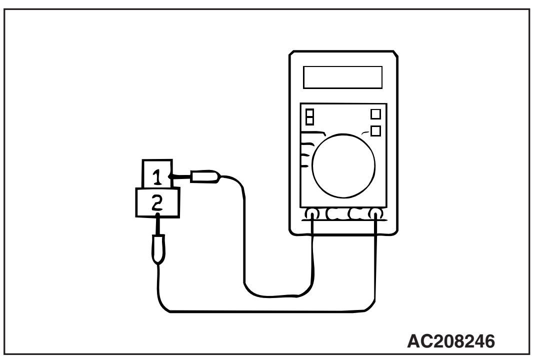
3. If within the standard value, check the power supply and the earth circuits.
4. If not within the standard value, drain the CVT fluid and remove the valve body cover.

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AC207111AB

5. Disconnect the solenoid valve connectors.




AC208246

6. Measure the resistance between terminals 1 and 2 at each solenoid valve side.

   **Standard value: 2.9 – 3.5 Ω (CVT fluid temperature 20°C)**

**⚠ CAUTION**

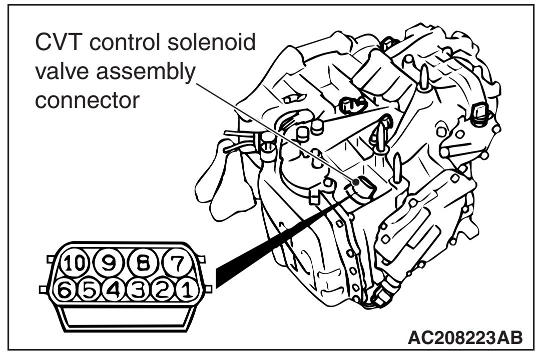
**The single shift control solenoid valve cannot be removed nor replaced. If the shift control solenoid valve needs to be replaced, replace the valve body assembly.**

7. If not within the standard value, replace the solenoid valve.
8. If within the standard value, check the harness wire between CVT control solenoid valve assembly connector and each solenoid valve connector. If a problem is not found at the steps above, check the solenoid valve O-rings and replace if necessary.

## CVT FLUID TEMPERATURE SENSOR CHECK

M1231229600041

1. Disconnect the CVT control solenoid valve assembly connector.




AC208223AB

2. Measure the resistance between CVT control solenoid valve assembly connector terminals 1 and 2.

   **Standard value:**

| CVT fluid temperature (°C) | Resistance value (kΩ) |
|---|---|
| 0 | 16.7 – 20.5 |
| 20 | 7.3 – 8.9 |
| 40 | 3.4 – 4.2 |
| 60 | 1.9 – 2.2 |
| 80 | 1.0 – 1.2 |
| 100 | 0.57 – 0.69 |

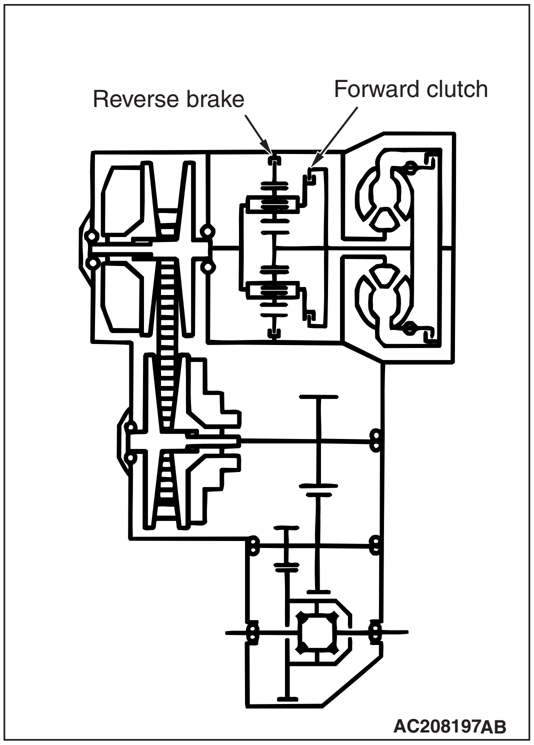
   *NOTE: The N range lamp on the combination meter flashes when the temperature reaches approximately 145°C or higher and then stops flashing when the temperature drops below approximately 135°C.*

3. If the CVT fluid temperature sensor resistance and the temperature when the N range indicator is flashing or switched off are outside the standard value ranges, replace the CVT fluid temperature sensor.

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## TORQUE CONVERTER STALL TEST

M1231205400117




The purpose of this test is to measure the maximum engine speed when the torque converter stalls in D or R ranges in order to check the torque converter (Stator and one-way clutch operation) and the holding performance of the clutches and brakes which are built into the transmission.

⚠ ***WARNING***

***For safety, the front and rear of the vehicle should be kept clear of other people while this test is being carried out.***

1. Check the CVT fluid level, the CVT fluid temperature and the engine coolant temperature.
   - CVT fluid level: HOT position on oil level gauge
   - CVT fluid temperature: 70 – 80°C
   - Engine coolant temperature: 80 – 100°C

   *NOTE: The CVT fluid temperature is measured with M.U.T.-III.*
2. Raise the vehicle.
3. Pull the parking brake lever to apply the parking brake and depress the brake pedal fully.
4. Start the engine.

⚠ **CAUTION**

- **Do not keep the throttle fully open for any longer than 5 seconds.**
- **If you repeat the stall test when the CVT fluid temperature is greater than 80°C, move the selector lever to the "N" position and let the engine run at approximately 1,000 r/min for at least one minute. Wait until the CVT fluid temperature returns to 80°C or less.**

5. Move the selector lever to the D position, fully depress the accelerator pedal and quickly take a reading of the maximum engine speed at this time.

   **Standard stalling engine speed: 2,200 – 2,700 r/min**
6. Move the selector lever to the R position and repeat the test described above.

   **Standard stalling engine speed: 1,800 – 2,300 r/min**

## TORQUE CONVERTER STALL TEST JUDGMENT RESULTS

1. Stall speed is too high in both D and R ranges
   - Malfunction of the torque converter (Slippage on the splines of the torque converter and the input shaft)
   - Malfunction of the valve body
   - Damaged harness and connector
   - Malfunction of the engine-CVT-ECU
2. Stall speed is too high in D range only
   - Forward clutch slippage
3. Stall speed is too high in R range only
   - Reverse brake slippage
4. Stall speed is too low in both D and R ranges
   - Malfunction of the torque converter (Slippage of the one-way clutch)
   - Low line pressure
   - Poor engine output

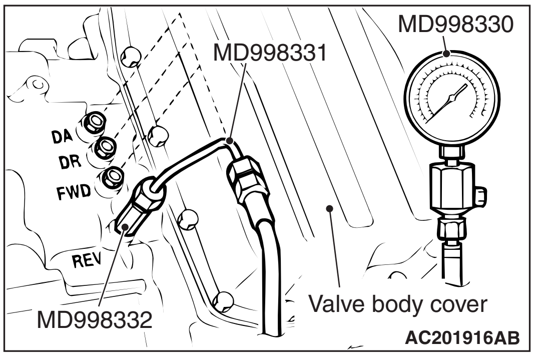
## HYDRAULIC PRESSURE TESTS

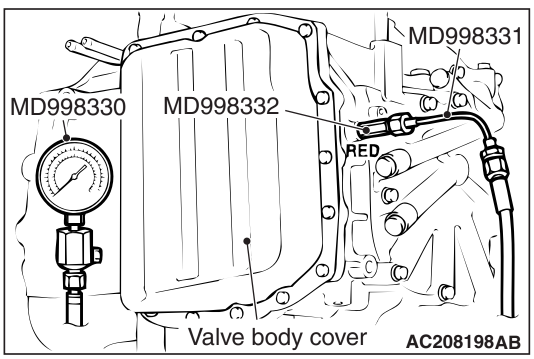
M1231205500062

⚠ CAUTION

**The CVT fluid temperature should be between 70 – 80°C during the test.**

1. Check the CVT fluid level, temperature and engine coolant temperature.
   - CVT fluid level: HOT mark on the dipstick
   - CVT fluid temperature: 70 – 80°C
   - Engine coolant temperature: 80 – 100°C
2. Stop the engine and raise the vehicle.




3. Connect the following special tools to each pressure discharge port.
   - Oil pressure gauge <3.0 MPa> (MD998330)
   - Oil pressure gauge joint (MD998331)
   - Hose adapter (MD998332)

*NOTE:*
*DA: Torque converter apply pressure port*
*DR: Torque converter release pressure port*
*2WD: Forward clutch pressure port*
*REV: Reverse brake pressure port*
*RED: Reducing pressure port*

*NOTE: For details on the primary pressure and line pressure, refer to the M.U.T.-III service data. (Refer to P.23A-123).*

4. Restart the engine.
5. Check that there are no leaks around the special tool port adapters.
6. Pull the parking brake lever, and step on the brake pedal completely. (Continue stepping on the pedal during measurement).

⚠ ***WARNING***

***For safety, the front and rear of the vehicle should be kept clear of other people while this test is being carried out.***

⚠ CAUTION

**Do not make measurement with the selector lever at the R, D, Ds or L range for more than 30 seconds to prevent excessive oil pressure. If you repeat this operation, let the engine run at idle for at least one minute by moving the selector lever at the N or P range.**

7. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.
8. If the pressure is not within the standard value, stop the engine and refer to the hydraulic pressure test diagnosis table.
9. Remove the O-ring from the port plug and replace it.
10. Remove the special tool, and install the plugs to the hydraulic pressure ports.
11. Start the engine and check that there are no leaks around the plugs.

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## STANDARD HYDRAULIC PRESSURE TABLE

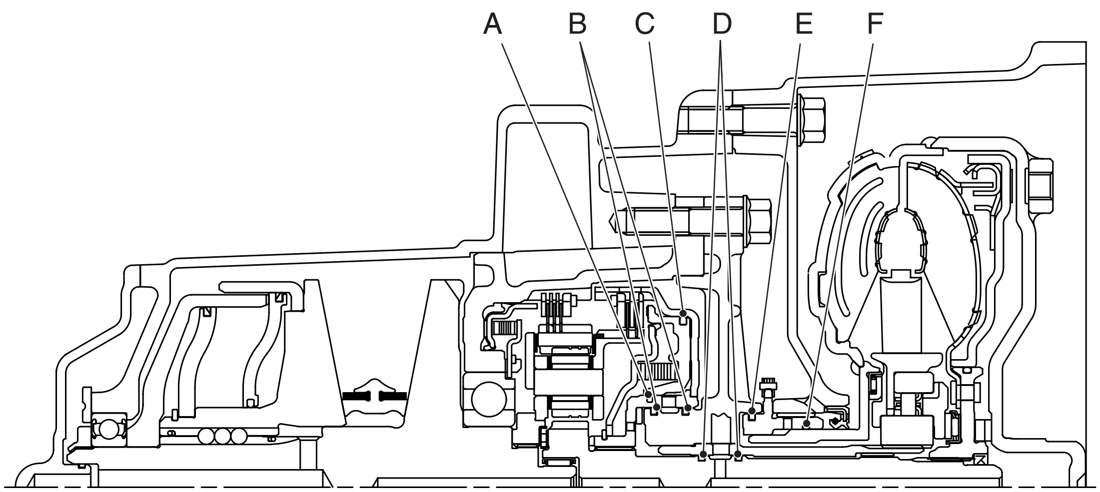
| Measurement condition | | Standard hydraulic pressure MPa | | | | | |
|---|---|---|---|---|---|---|---|
| Selector lever position | Engine speed (r/min) | Forward clutch pressure [2WD pressure] | Reverse brake pressure [REV pressure] | Reducing pressure [RED pressure] | Primary pressure | Line pressure | Torque converter pressure [DR pressure] |
| P | 1,500 | 0 | 0 | 0.4 – 0.6 | 0.2 – 1.1 | 0.6 – 3.0 | 0.4 – 0.6 |
| R | 1,500 | 0 | 1.0 – 1.4 | 0.4 – 0.6 | 0.4 – 1.1 | 1.0 – 3.0 | 0.4 – 0.6 |
| N | 1,500 | 0 | 0 | 0.4 – 0.6 | 0.2 – 1.1 | 0.6 – 3.0 | 0.4 – 0.6 |
| D | 1,500 | 0.9 – 1.1 | 0 | 0.4 – 0.6 | 0.4 – 1.1 | 1.0 – 3.0 | 0.4 – 0.6 |
| Ds | 1,500 | 0.9 – 1.1 | 0 | 0.4 – 0.6 | 0.4 – 1.1 | 1.0 – 3.0 | 0.4 – 0.6 |
| L | 1,500 | 0.9 – 1.1 | 0 | 0.4 – 0.6 | 0.4 – 1.1 | 1.0 – 3.0 | 0.4 – 0.6 |

## HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

| Trouble symptom | Probable cause |
|---|---|
| All hydraulic pressures are high | Improper measurement |
| All hydraulic pressures are low | Malfunction of the oil pump<br>Clogged internal oil filter<br>Clogged oil cooler<br>Malfunction of the regulator valve<br>Incorrect valve body installation |
| Only forward clutch hydraulic pressure is abnormal | Malfunction of the manual valve<br>Malfunction of the clutch pressure control valve<br>Malfunction of the clutch pressure reducing valve<br>Malfunction of the clutch pressure control solenoid valve<br>Clogged orifice<br>Incorrect valve body installation<br>Malfunction of the oil seal A, B, C |
| Only reverse brake hydraulic pressure is abnormal | Malfunction of the manual valve<br>Malfunction of the clutch pressure control valve<br>Malfunction of the clutch pressure reducing valve<br>Malfunction of the clutch pressure control solenoid valve<br>Clogged orifice<br>Incorrect valve body installation |
| Only reducing pressure is abnormal | Malfunction of the reducing valve<br>Clogged orifice<br>Incorrect valve body installation |

| Trouble symptom | Probable cause |
|---|---|
| Only line pressure is abnormal | Clogged orifice<br>Malfunction of the regulator valve<br>Incorrect valve body installation |
| Only torque converter output pressure is abnormal | Malfunction of the damper clutch control valve<br>Malfunction of the damper clutch control solenoid valve<br>Malfunction of the torque converter pressure control valve<br>Clogged orifice<br>Incorrect valve body installation<br>Malfunction of the torque converter<br>Malfunction of the oil seal D, E, F |
| Pressure applied to element which should not receive pressure | Incorrect transmission control cable adjustment<br>Malfunction of the manual valve<br>Incorrect valve body installation |

## OIL SEAL LAYOUT



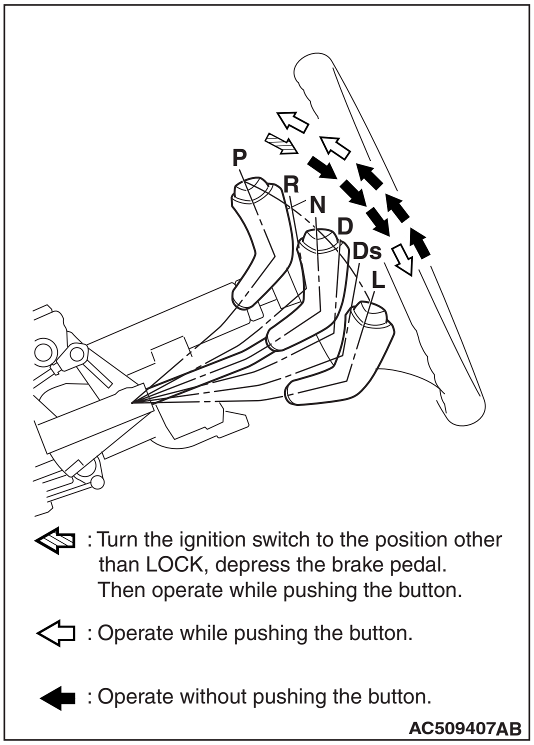

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## SELECTOR LEVER OPERATION CHECK

M1231202900113

1. Depress and hold the parking brake pedal.




2. Check that the selector lever can be moved through each range smoothly and securely.
3. Check that the engine starts when the selector lever is in the N or P position, and that it does not start when the selector lever is in any other position.
4. Start the engine, and then depress the parking brake pedal again to release it.
5. The vehicle should move forward when the selector lever is moved into D or Ds range, and moves backward when moved into R range.
6. Stop the engine.
7. Turn the ignition switch to the ON position, and check that the backup lamp illuminates when the selector lever is shifted from the P position to the R position.

   *NOTE: The A/T mis-operation prevention mechanism prevents movement of the selector lever from the P position if the ignition switch is in a position other than LOCK (OFF) position and the brake pedal is not depressed.*

## KEY INTERLOCK/SHIFT LOCK MECHANISM CHECK AND ADJUSTMENT

M1232003100614

1. Carry out the following check.

**<Key interlock side>**

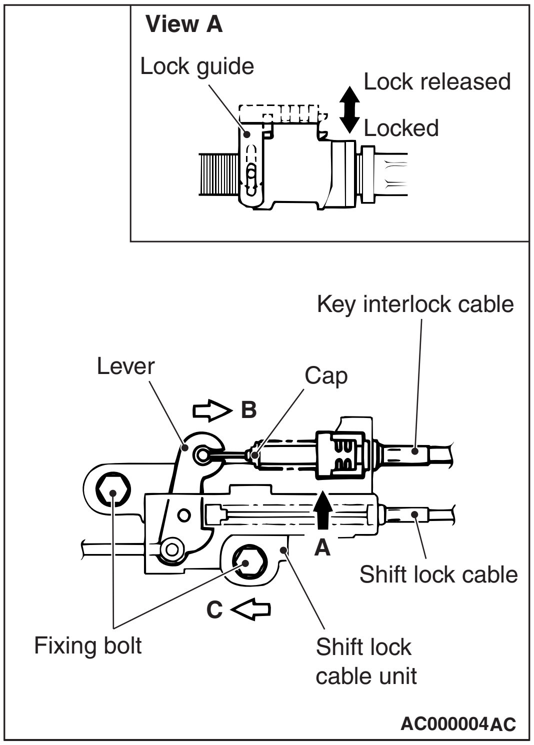
| Inspection procedure | Inspection conditions | | Check details (normal condition) |
|---|---|---|---|
| 1 | Brake pedal: Depressed | Ignition key position: LOCK (OFF) or pulled out | The selector lever push button cannot be pushed, and the selector lever should not be moved from P position. |
| 2 | | Ignition key position: Other than above | The selector lever push button can be pushed, and the selector lever can be moved from P position. |
| 3 | Selector lever position: Other than P position | | The ignition key cannot turned to LOCK (OFF) position. |
| 4 | Selector lever position: P position | | The ignition key can be turned to LOCK (OFF) position. |

**<Shift lock side>**

| Inspection procedure | Inspection conditions | | Check details (normal condition) |
|---|---|---|---|
| 1 | Ignition switch position: ACC | Brake pedal: Depressed | The selector lever push button can be pushed, and the selector lever can be moved from P position. |
| 2 | | Brake pedal: Not depressed | The selector lever push button cannot be pushed, and the selector lever should not be moved from P position. |

2. If the operations above are abnormal, check the shift lock cable unit in the following procedures.
   (1) Remove the instrument lower panel (Refer to GROUP 52A – Instrument Panel Assembly P.52A-3).
   (2) Remove the steering column lower cover (Refer to GROUP 37 – Steering Shaft P.37-92).
   (3) Shift the selector lever to the P position.
   (4) Turn the ignition switch to the LOCK (OFF) position.
   (5) Lift the lock guide of the key interlocking cable and then unlock it.

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(6) Loosen the bolts fixing the shift lock cable unit, push the lever in direction B and tighten the bolts to the specified torque.

**Tightening torque: 5.0 ± 1.0 N·m**

(7) Lower the lock guide of the key interlocking cable and then lock it.

*NOTE: The key interlocking cable is adjusted according to the lock position (cap push state) at this time. Readjust the lock position if key interlocking operations malfunction after locking.*

3. After adjustment, re-check the operations. Replace the shift lock cable unit if operations are defective (Refer to P.23A-148).

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# TRANSMISSION CONTROL

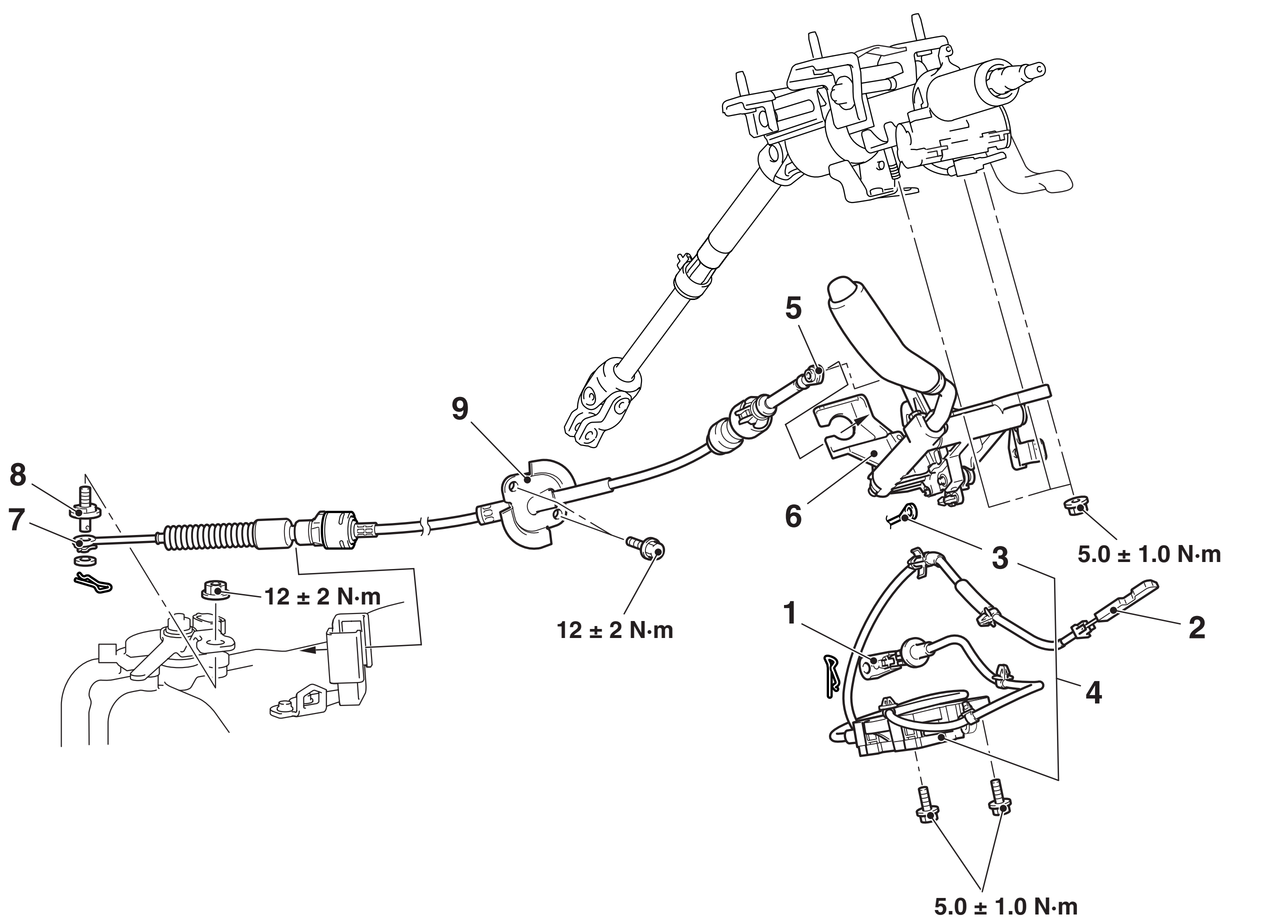
## REMOVAL AND INSTALLATION

M1231203200173

⚠ CAUTION

**When removing and installing the transmission control cable and shift lock cable unit, be careful not to hit the SRS-ECU.**

| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Steering column lower cover and instrument lower panel removal (Refer to GROUP 52A, Instrument Panel Assembly P.52A-3). | • Key interlock and shift lock mechanism check (Refer to P.23A-144).<br>• Selector lever operation check (Refer to P.23A-143).<br>• Steering column lower cover and instrument lower panel installation (Refer to GROUP 52A, Instrument Panel Assembly P.52A-3). |




**Removal steps**

- Shift the selector lever to the N position.
- Air cleaner assembly
- Battery and battery tray
- Connectors and clamps around steering column assembly

1. Shift lock cable connection

<<A>> >>D<< 2. Key interlock rod connection

>>C<< 3. Shift lock rod connection

**Removal steps (Continued)**

>>C<< 4. Shift lock cable unit

>>B<< 5. Transmission control cable connection (selector lever side)

6. Selector lever assembly

>>A<< 7. Transmission control cable connection (transmission side)

8. Adjuster
9. Transmission control cable

## REMOVAL SERVICE POINTS

### <<A>> KEY INTERLOCK ROD REMOVAL

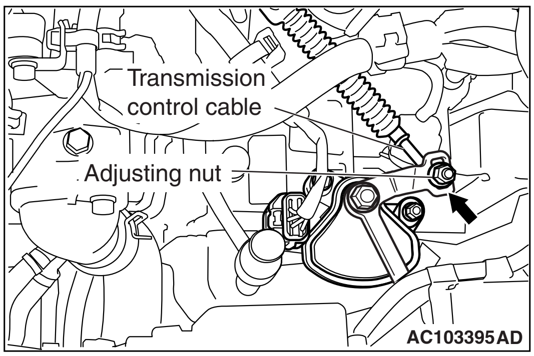
⚠ CAUTION

**Do not bend the key interlock rod cable.**

Turn the ignition switch to the ACC position and then pull the key interlock rod out from the ignition key cylinder.

## INSTALLATION SERVICE POINTS

### >>A<< TRANSMISSION CONTROL CABLE (TRANSMISSION SIDE) INSTALLATION




1. Shift the selector lever and manual control lever to the N position.
2. Gently push the transmission control cable in the direction of the arrow (with a force of approximately 5 N) to tighten the adjusting nut to the specified torque.

   **Tightening torque: 12 ± 2 N·m**

### >>B<< TRANSMISSION CONTROL CABLE (SELECTOR LEVER SIDE) INSTALLATION

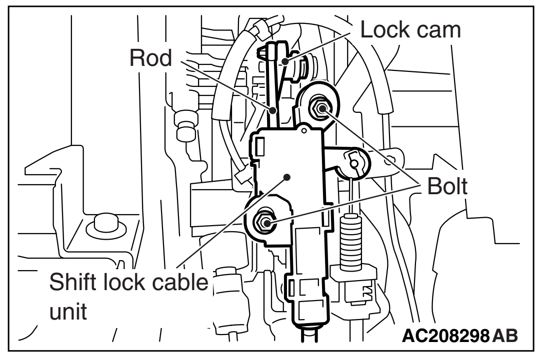
Ensure that the transmission control cable is connected securely.

### >>C<< SHIFT LOCK CALBLE UNIT/SHIFT LOCK ROD INSTALLATION

⚠ CAUTION

**Do not bend the shift lock cable.**

1. Shift the selector lever to the P position and turn the ignition switch to the LOCK (OFF) position.




2. After installing the shift lock rod to the lock cam of the selector lever assembly, tighten the bolts of the shift lock cable unit to the specified torque.

   **Tightening torque: 5.0 ± 1.0 N·m**

### >>D<< KEY INTERLOCK ROD INSTALLATION

⚠ CAUTION

**Do not bend the key interlock rod cable.**

Turn the ignition switch to the ACC position and then install the key interlock rod through the ignition key cylinder.

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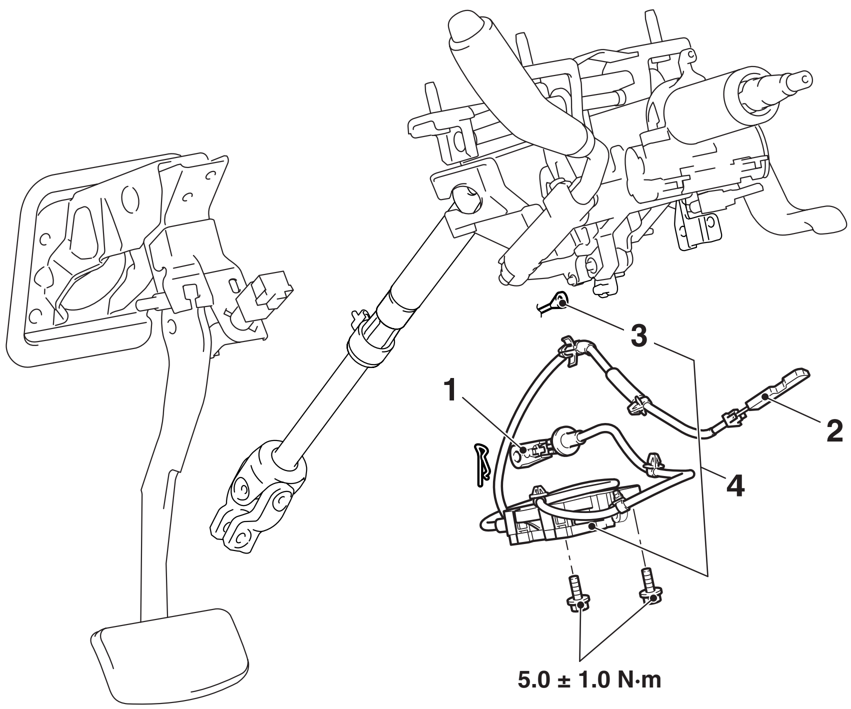
# CVT KEY INTERLOCK AND SHIFT LOCK MECHANISMS

## REMOVAL AND INSTALLATION

M1231203400144

**⚠ CAUTION**
**When removing and installing the shift lock cable unit, be careful not to hit the SRS-ECU.**

| Pre-removal Operation | Post-installation Operation |
| --- | --- |
| • Steering column lower cover and instrument lower panel removal (Refer to GROUP 52A, Instrument Panel Assembly P.52A-3). | • Key interlock and shift lock mechanism check (Refer to P.23A-144).<br>• Selector lever operation check (Refer to P.23A-143).<br>• Steering column lower cover and instrument lower panel installation (Refer to GROUP 52A, Instrument Panel Assembly P.52A-3). |




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**Removal steps**

- • Connectors and clamps around steering column assembly
- 1. Shift lock cable connection
- <<**A**>> >>**B**<< 2. Key interlock rod connection

**Removal steps (Continued)**

- >>**A**<< 3. Shift lock rod connection
- >>**A**<< 4. Shift lock cable unit

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## REMOVAL SERVICE POINTS

### <<A>> KEY INTERLOCK ROD REMOVAL

⚠ CAUTION

**Do not bend the key interlock rod cable.**

Turn the ignition switch to the ACC position and then pull the key interlock rod out from the ignition key cylinder.

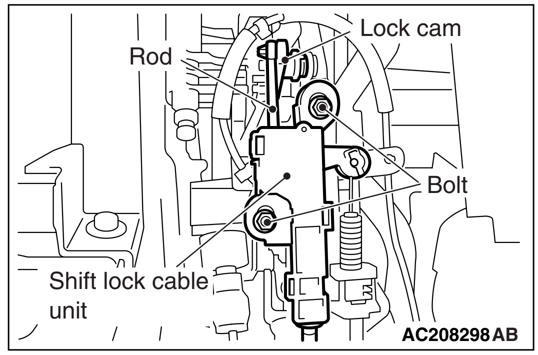
## INSTALLATION SERVICE POINTS

### >>A<< SHIFT LOCK CALBLE UNIT/SHIFT LOCK ROD INSTALLATION

⚠ CAUTION

**Do not bend the shift lock cable.**

1. Shift the selector lever to the P position and turn the ignition switch to the LOCK (OFF) position.




2. After installing the shift lock rod to the lock cam of the selector lever assembly, tighten the bolts of the shift lock cable unit to the specified torque.

   **Tightening torque: 5.0 ± 1.0 N·m**

### >>B<< KEY INTERLOCK ROD INSTALLATION

⚠ CAUTION

**Do not bend the key interlock rod cable.**

Turn the ignition switch to the ACC position and then install the key interlock rod to the ignition key cylinder.

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# TRANSMISSION ASSEMBLY

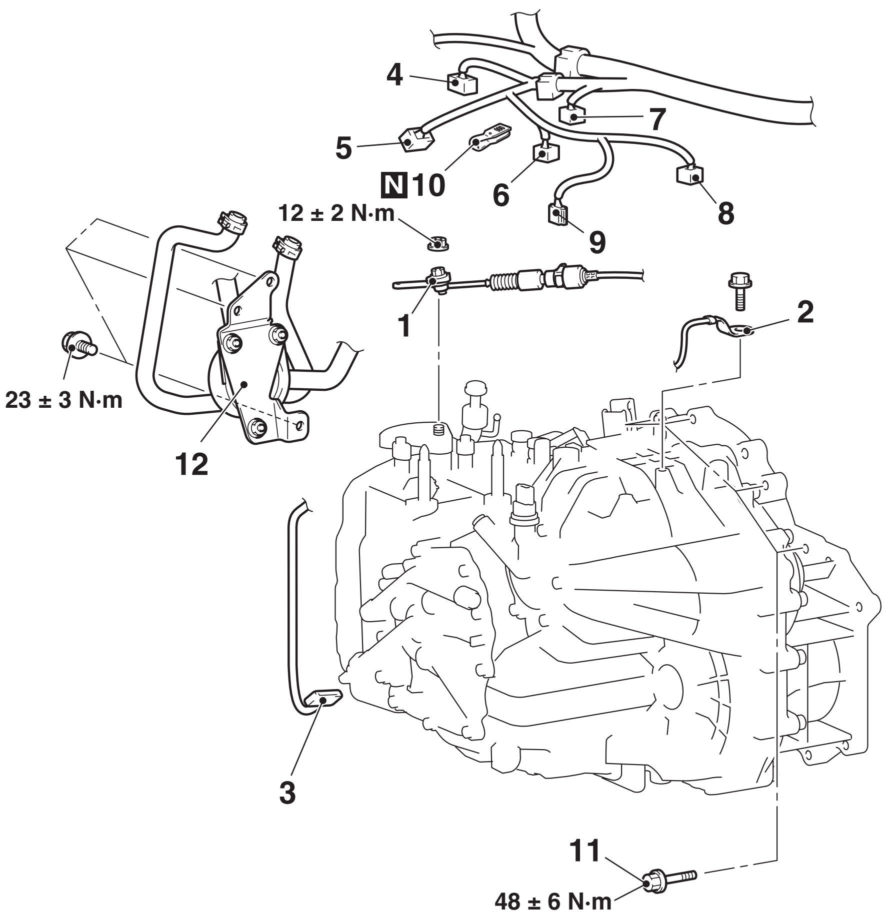
## REMOVAL AND INSTALLATION

M1231203600201

⚠ CAUTION

***: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle on the earth and loading the full weight of the engine on the vehicle body.**

| Pre-removal Operation | Post-installation Operation |
|---|---|
| • Front Under Cover Panel AssemblyRemoval (Refer to GROUP 51, Front Bumper Assembly and Radiator Grille P.51-2).<br>• Transmission Fluid Draining (Refer to P.23A-133).<br>• Air Cleaner Assembly Removal (Refer to GROUP 15 P.15-5).<br>• Battery and Battery Tray Removal.<br>• Wiper Arm and Blade Assembly and Front Deck Garnish Removal (Refer to GROUP 51, Windshield Wiper P.51-29).<br>• Cowl Top Panel Removal (Refer to GROUP 42, Loose Panel P.42-81).<br>• Front Exhaust Pipe Removal (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-19).<br>• Driveshaft Removal (Refer to GROUP 26 P.26-16). | • Driveshaft Installation (Refer to GROUP 26 P.26-16).<br>• Front Exhaust Pipe Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-19).<br>• Cowl Top Panel Installation (Refer to GROUP 42, Loose Panel P.42-81).<br>• Wiper Arm and Blade Assembly and Front Deck Garnish Installation (Refer to GROUP 51, Windshield Wiper P.51-29).<br>• Battery and Battery Tray Installation.<br>• Air Cleaner Assembly Installation (Refer to GROUP 15 P.15-5).<br>• Front Under Cover Panel Assembly Installation (Refer to GROUP 51, Front Bumper Assembly and Radiator Grille P.51-2).<br>• Transmission Fluid Refilling (Refer to P.23A-133) |




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**Removal steps**

1. Transmission control cable connection
2. Battery earth

**Removal steps (Continued)**

3. Primary pressure sensor harness connector
4. Inhibitor switch connector

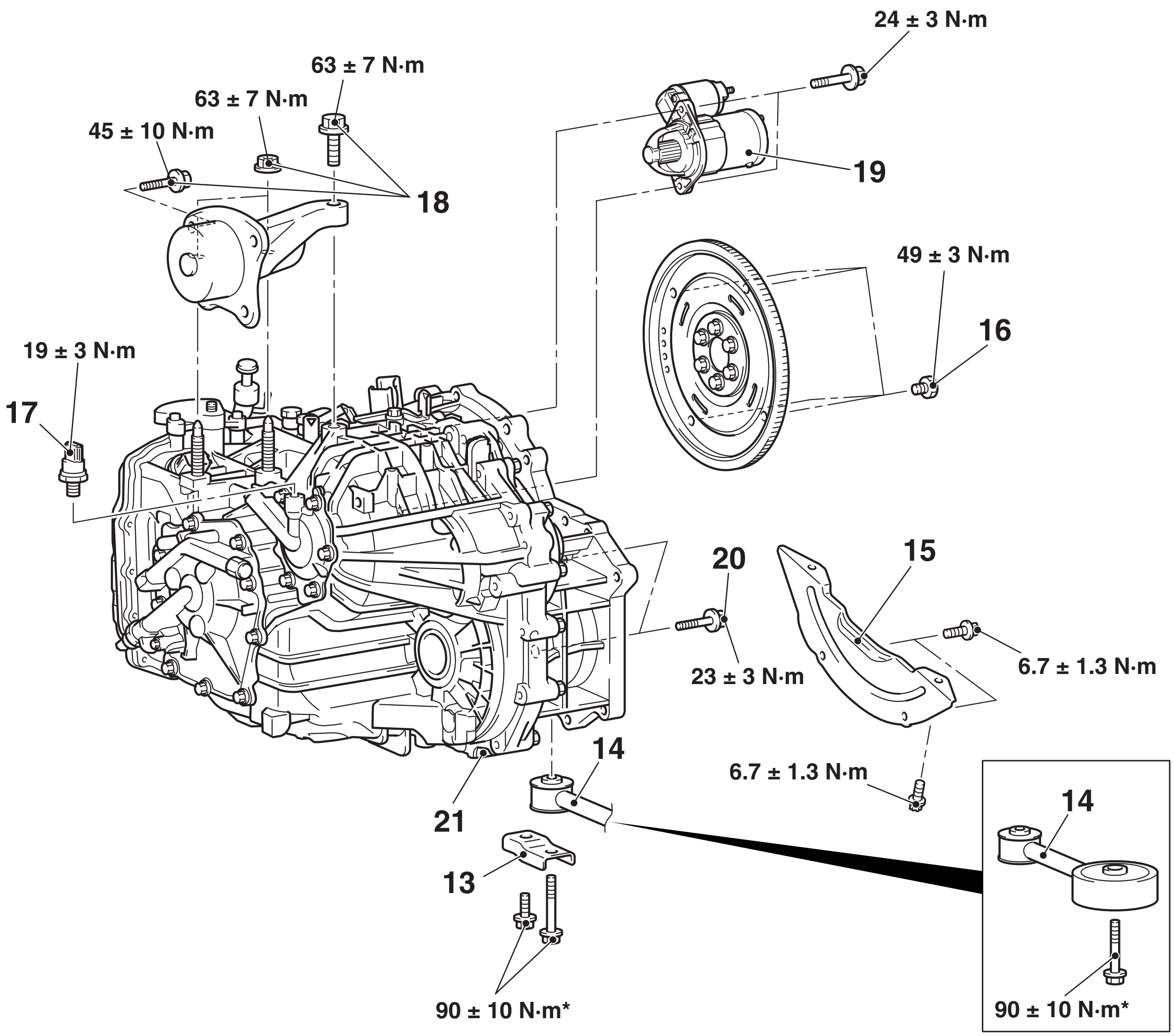
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**Removal steps (Continued)**

5. CVT control solenoid valve assembly connector
6. Primary speed sensor connector
7. Turbine speed sensor connector
8. Secondary speed sensor connector
9. Line pressure sensor connector

**Removal steps (Continued)**

<<A>> 10. Cable band
<<B>> 11. Transmission assembly upper part coupling bolt
12. ATF warmer connection




AC403792AD

**Removal steps**

13. Engine mounting stay
14. Engine roll stopper rod assembly
15 Bell housing cover
<<C>> 16. Torque converter and drive plate coupling bolt
17. Secondary pressure sensor
- Raise the engine and transmission assembly to the position where the engine weight is not applied to the transmission mounting insulator.

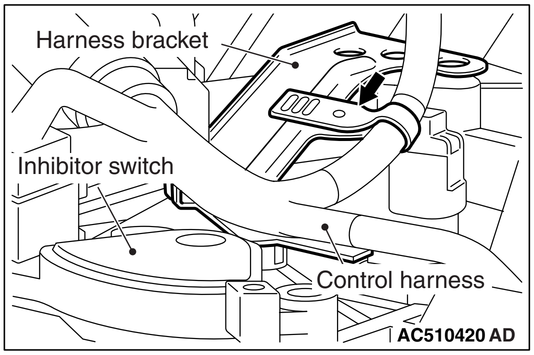
**Removal steps (Continued)**

18. Transmission mounting insulator coupling bolt and nut
<<D>> • Holding the engine assembly
19. Starter
20. Transmission assembly lower part coupling bolt
>>A<< 21. Transmission assembly

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## REMOVAL SERVICE POINTS

### <<A>> CABLE BAND REMOVAL




When removing the control harness, cut the cable band indicated by the arrow in the figure.

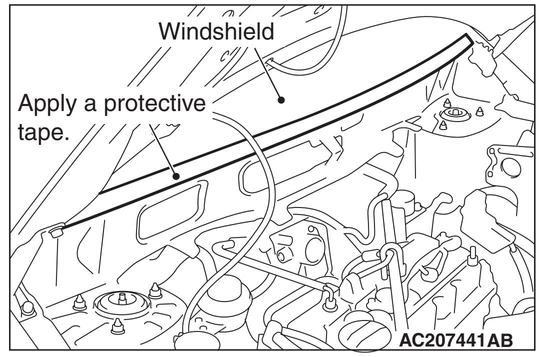
### <<B>> TRANSMISSION ASSEMBLY UPPER COUPLING BOLT REMOVAL

Do not fully unscrew the bolts from the engine and transmission assembly. Only loosen the bolts.

### <<C>> TORQUE CONVERTER AND DRIVE PLATE COUPLING BOLTS REMOVAL

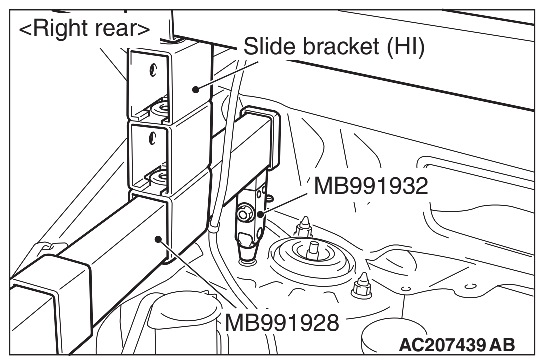
1. Remove the coupling bolts while turning the crankshaft.
2. Push in the torque converter into the transmission side and make a point to ensure that the torque converter does not remain on the engine side.

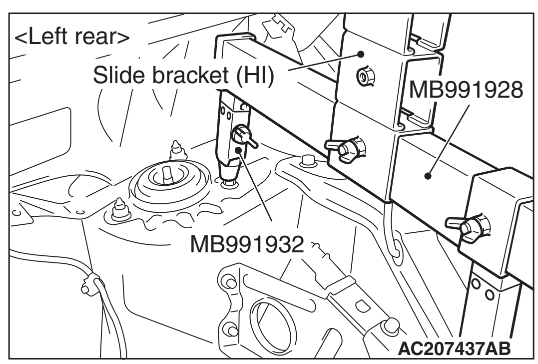
### <<D>> SUPPORTING THE ENGINE ASSEMBLY




1. Wrap a protective tape to avoid damage to the windshield.

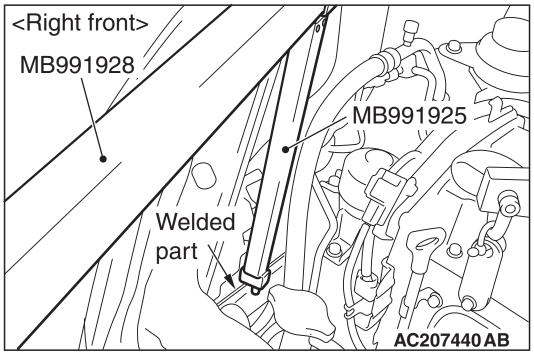
2. <Using the special tool Engine Hanger (MB991928)>
   (1) Assemble the special tool Engine Hanger (MB991928) (Set the components below to the base hanger).
   - Slide bracket (HI)
   - Foot (standard) (MB991932)
   - Engine hanger attachment (MB991925)

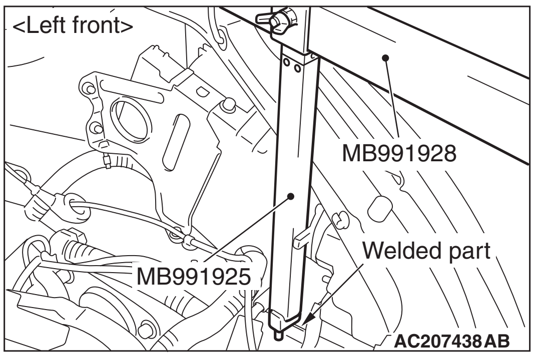



   (2) Set the special tool Foot (standard) (MB991932) to the front fender strut assembly mounting nut as shown.

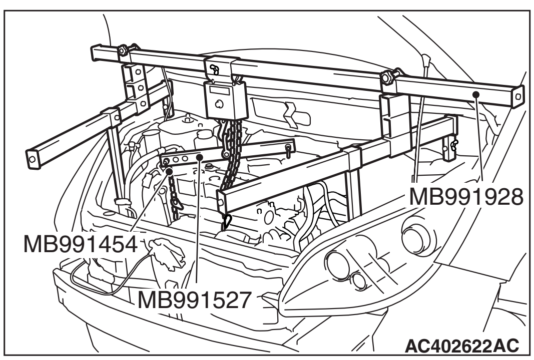
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(3) Set the special tool Engine Hanger Attachment (MB991925) to the front side member welded part as shown.

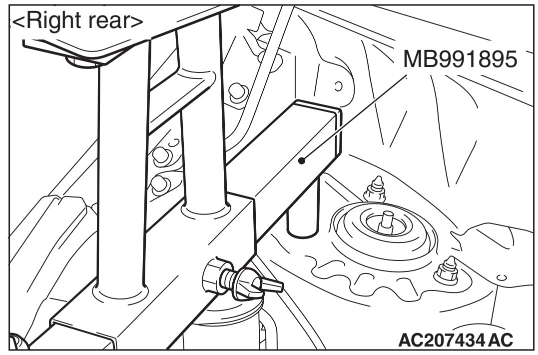
*NOTE: Adjust the balance of the engine hanger by sliding the engine hanger attachment (MB991925) and the slide bracket (HI).*

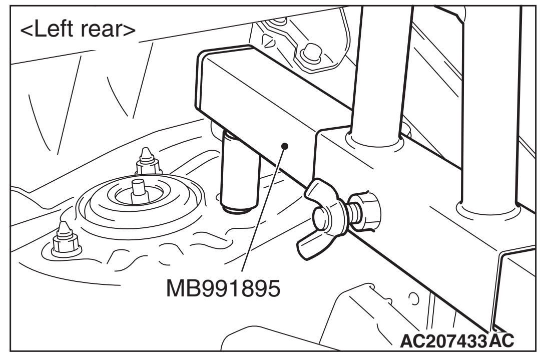



(4) Set the special tool Hanger (MB991527) and the chain of the Engine Hanger Balancer (MB991454). Then remove the transmission assembly upper coupling bolts while supporting the engine and transmission assembly.

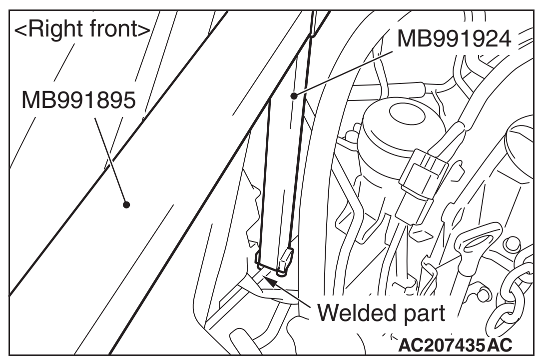
3. <Using the special tool Engine Hanger (MB991895)>

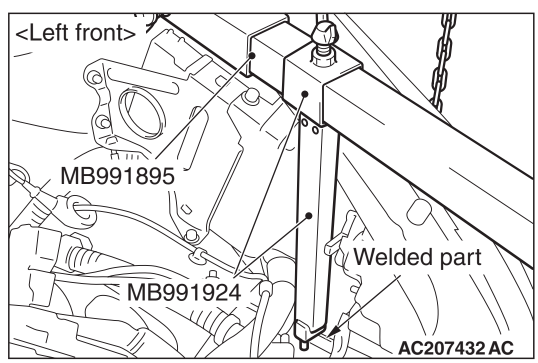
(1) Set the engine hanger attachment (MB991924) to the special tool Engine Hanger (MB991895).




(2) Set the rear foot of the special tool Engine Hanger (MB991895) to the front fender strut assembly mounting nut as shown.

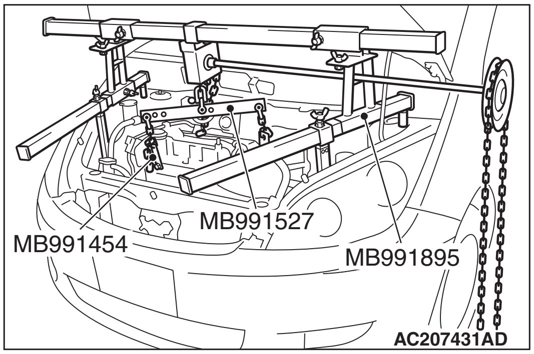



(3) Set the special tool Engine Hanger Attachment (MB991924) to the front side member welded part as shown.

*NOTE: Adjust the balance of engine hanger by sliding the engine hanger attachment (MB991924).*

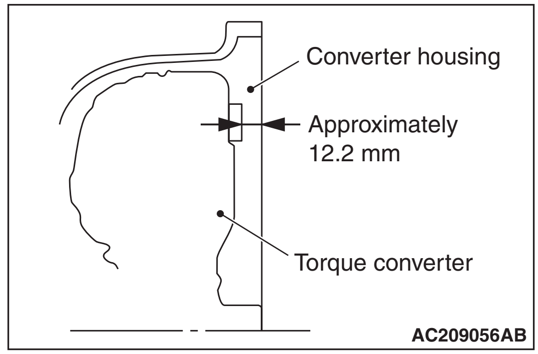
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(4) Set the special tool Hanger (MB991527) and the chain of the Engine Hanger Balancer (MB991454). Then remove the transmission assembly upper coupling bolts while supporting the engine and transmission assembly.

## INSTALLATION SERVICE POINTS

## >>A<< TRANSMISSION ASSEMBLY INSTALLATION




Engage the torque converter into the transmission side securely, and then assemble the transmission assembly on the engine.

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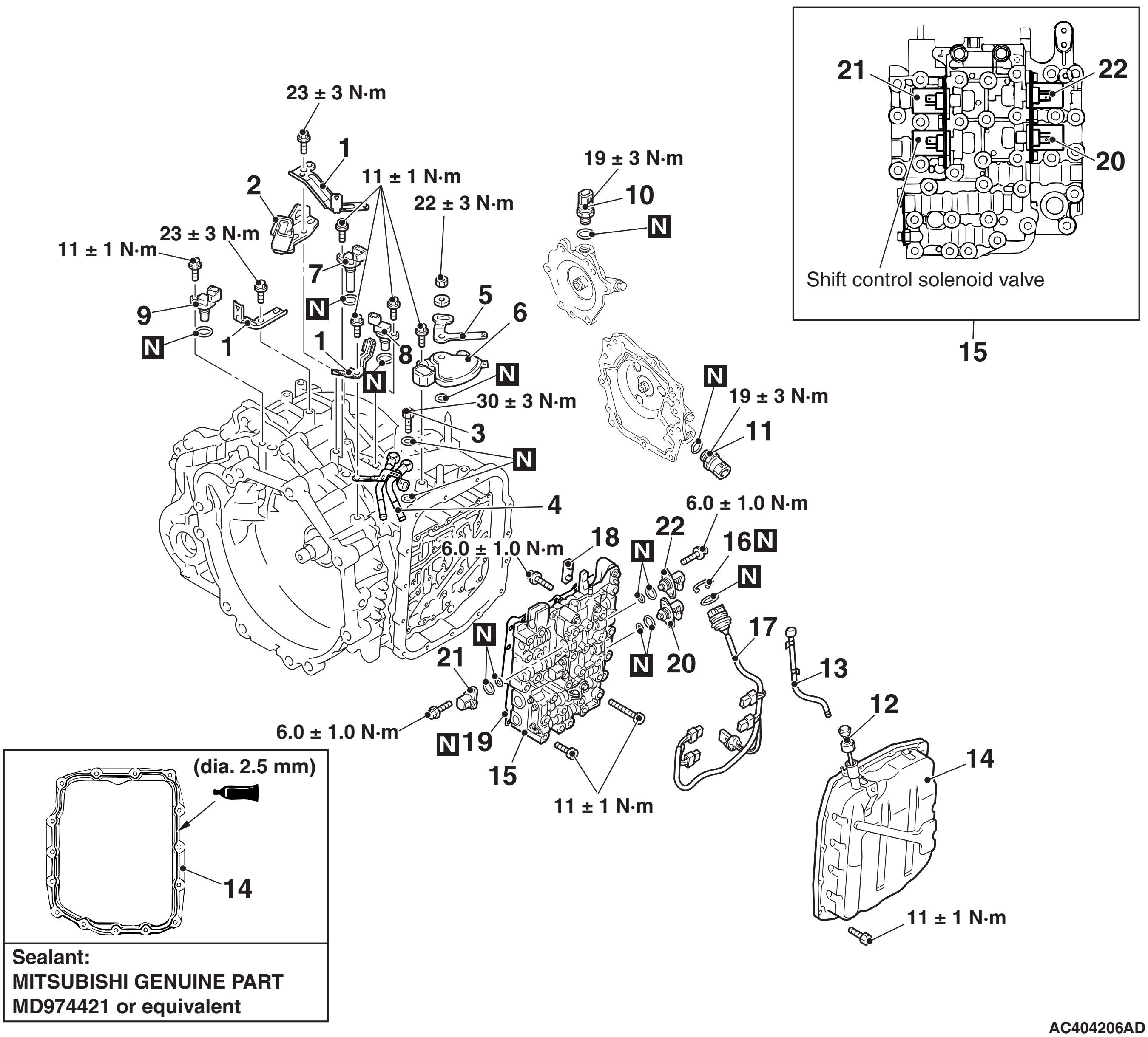
# VALVE BODY ASSEMBLY, SENSORS

## REMOVAL AND INSTALLATION

M1231204000150

**Pre-removal and Post-installation Operation**

- Air cleaner assembly removal and installation (Refer to GROUP 15, Air Cleaner P.15-5).
- Battery and battery tray removal and installation




**Bracket removal steps**

1. Harness bracket
2. Control cable bracket

**Oil cooler pipe removal steps**

- Oil cooler hose connection

3. Eye bolt
4. Oil cooler pipe

**Inhibitor switch removal steps**

- Transmission control cable (transmission side) <<A>>

**Inhibitor switch removal steps**

5. Manual control lever
6. Inhibitor switch

**Sensor removal steps**

2. Control cable bracket

- Harness connector connection

7. Turbine speed sensor
8. Primary speed sensor
9. Secondary speed sensor
10. Line pressure sensor

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**Sensor removal steps**

- Front under cover panel assembly (Refer to GROUP 51, Front Bumper Assembly and Radiator Grille P.51-2).
- <<**A**>> 11. Primary pressure sensor
- Transmission fluid draining and refilling (Refer to P.23A-133).
- 6. Inhibitor switch
- Cooling fan, cooling fan motor and shroud assembly (Refer to GROUP 14, Radiator P.14-22).
- 12. Oil level gauge
- >>**C**<< 13. Breather hose assembly
- 14. Valve body cover
- <<**B**>> >>**B**<< 15. Valve body assembly
- 16. Snap ring
- 17. Solenoid valve harness and CVT oil temperature sensor

**Oil strainer removal steps**

- Harness connector connection
- Transmission fluid draining and refilling (Refer to P.23A-133).
- 6. Inhibitor switch
- Cooling fan, cooling fan motor and shroud assembly (Refer to GROUP 14, Radiator P.14-22).
- 12. Oil level gauge
- >>**C**<< 13. Breather hose assembly
- 14. Valve body cover
- <<**B**>> >>**B**<< 15. Valve body assembly
- 18. Oil strainer
- 19. Inside separating plate

**Solenoid valve removal steps**

- Harness connector connection
- Transmission fluid draining and refilling (Refer to P.23A-133).
- 6. Inhibitor switch
- Cooling fan, cooling fan motor and shroud assembly (Refer to GROUP 14, Radiator P.14-22).
- 12. Oil level gauge
- >>**C**<< 13. Breather hose assembly
- 14. Valve body cover
- <<**B**>> >>**B**<< 15. Valve body assembly
- 17. Solenoid valve harness and CVT oil temperature sensor
- <<**C**>> >>**A**<< 20. Line pressure control solenoid valve
- <<**C**>> >>**A**<< 21. Damper clutch control solenoid valve
- <<**C**>> >>**A**<< 22. Clutch pressure control solenoid valve

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## REMOVAL SERVICE POINTS

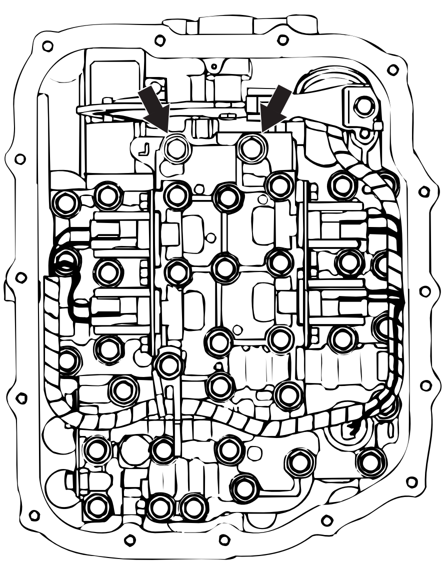
### <<A>> LINE PRESSURE SENSOR/PRIMARY PRESSURE SENSOR REMOVAL

⚠ CAUTION

**The line pressure sensor and primary pressure sensor incorporate integrated circuit. If the sensor connector is disconnected, be careful not to let water enter the sensor-side connector.**

### <<B>> VALVE BODY ASSEMBLY REMOVAL

⚠ CAUTION



AC207317AC

**Do not remove the two bolts indicated by arrow in the figure.**

Remove the 34 valve body assembly mounting bolts.

### <<C>> SOLENOID VALVE REMOVAL

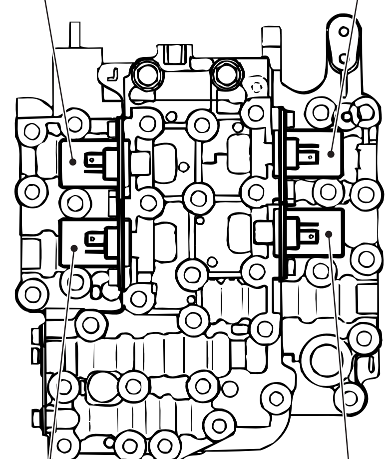
⚠ CAUTION

**The shift control solenoid valve cannot be removed or replaced as individual part. If the shift control solenoid valve must be replaced, replace it as a valve body assembly.**

Paint a white mark so that the installation position can be identified.

## INSTALLATION SERVICE POINTS

### >>A<< SOLENOID VALVE INSTALLATION



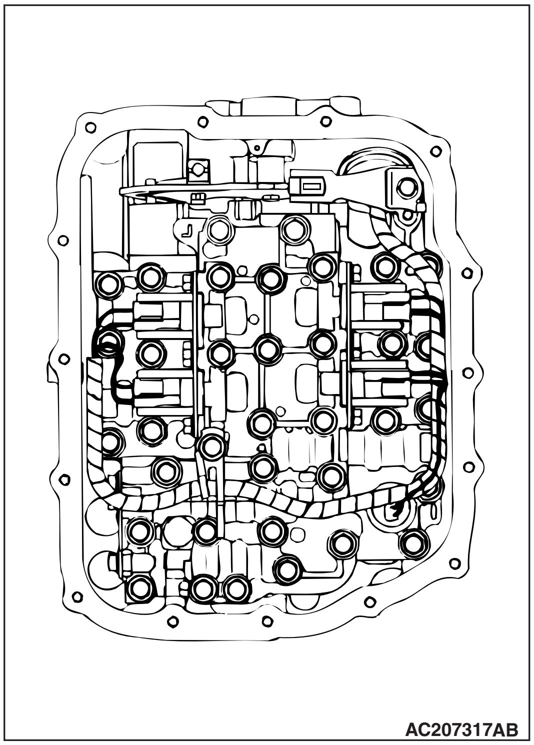

AC207318 AB

Tighten each solenoid valve to the specified torque as identified by paint mark made during removal.

**Tightening torque: 6.0 ± 1.0 N·m**

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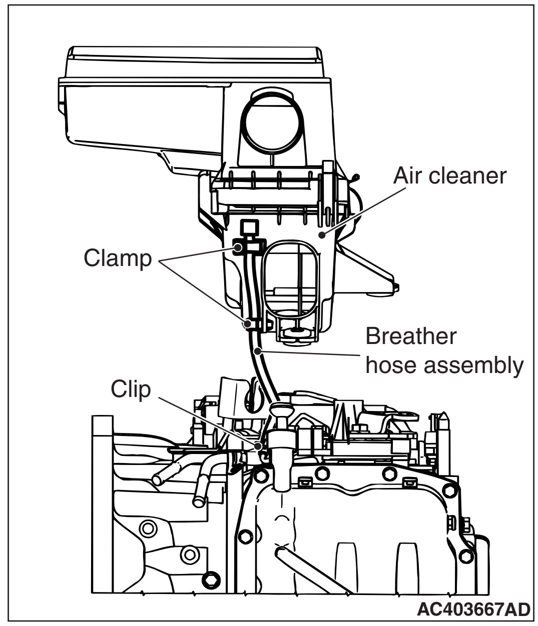
## >>B<< VALVE BODY ASSEMBLY INSTALLATION




Tighten the 34 valve body assembly mounting bolts to the specified torque.

**Tightening torque: 11 ± 1 N·m**

## >>C<< BREATHER HOSE ASSEMBLY INSTALLATION




Install each clamp of breather hose assembly to the hole of air cleaner securely so that the claw of clip faces towards the front of the vehicle.

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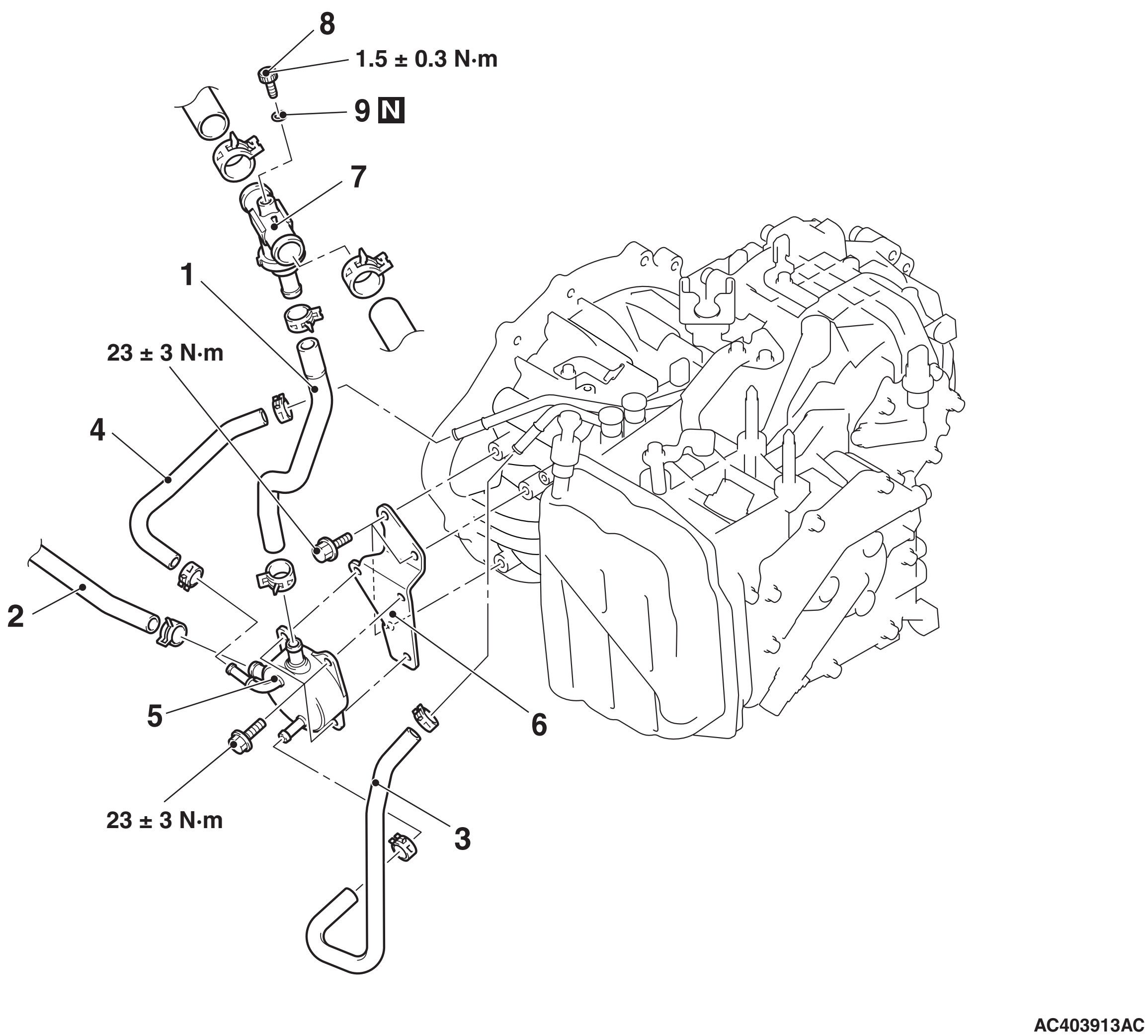
# ATF WARMER (ATF COOLER)

## REMOVAL AND INSTALLATION

M1231204800048

**Pre-removal and Post-installation Operation**

- Air cleaner intake duct (Refer to GROUP 15 – Air Cleaner P.15-5).
- Engine coolant draining and refilling (Refer to GROUP 14 – On-vehicle Service – Engine Coolant Replacement P.14-4).
- Transmission fluid refilling (Refer to P.23A-133)




**Removal steps**

1. Coolant feed hose
2. Coolant return hose
3. ATF feed hose
4. ATF return hose
5. ATF warmer (ATF cooler)

**Removal steps (Continued)**

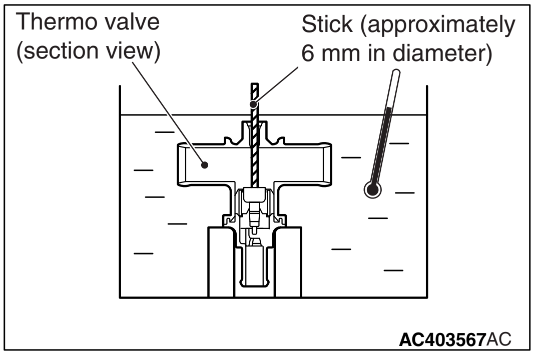
6. ATF warmer (ATF cooler) bracket
7. Thermo valve
8. Breather plug
9. O-ring

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## THERMO VALVE CHECK

M1231204900056

1. Remove the thermo valve breather plug.




2. Obtain a container which is full of water, and insert a stick (approximately 6 mm in diameter) to the thermo valve. While stirring the water, raise the water temperature and check that the valve opening temperature of the thermo valve is within the standard value. The stick rises when the thermo valve opens.

   **Standard value: 75°C ± 1.5°C**

3. When the water temperature is raised to the fully open temperature, check that the valve lift amount is within the standard value.

   **Standard value: Opening temperature 88 °C**
   **Valve lift amount when it is fully opened: 3 mm or more**

   *NOTE: Measure the height of the fully closed valve in advance, and then measure the valve height at opening temperature to calculate the valve lift amount.*